Developing an Academic Logistics Course Using the Action Research Approach

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Abstract

Academic institutions that offer practical programs face several challenges, such as teaching heterogeneous classes, maintaining relevant and up-to-date syllabi, and competing with other institutions. These challenges are relevant to academic logistics programs as well. One way to tackle these challenges is through continuous improvement of teaching methods and course content. This article presents a process of developing and improving an introductory academic course in management and logistics for a Bachelor of Arts (BA) program using the action research approach. The study's results encourage curriculum developers in academic institutions to view the curriculum and its creation as an ongoing process, and to explore varied ways to teach it. Our findings also highlight the value of a student-centred approach to academic teaching and curricula development that calls for acute awareness of potential variation in students' experience and abilities.

Keywords: logistics, curricula, academic programs, heterogenous class, action research

1. Introduction

Learning in the 21st century requires students to acquire diverse skills and abilities in order to keep pace with an accelerated information revolution. In a society characterized by information overload, building a strong skill set is becoming increasingly important (Castronova, 2002). The growing number of students in higher education demands a closer examination of the heterogeneity in students' social background and teaching strategies (Thomsen, 2012). Colleges and universities are putting more emphasis on the development of teaching and learning methods to better prepare graduates to meet specific labor market demands. In higher education institutions, different skills, competencies, and content require varied approaches for students to learn most effectively.

According to Thomsen (2012), most schools are encouraging instructors to use various teaching techniques. There is a consensus among higher education leaders that universities need to offer a student-centered learning experience that enables students to acquire the right knowledge and skills for future employment. Curriculum and instruction best practices are based on well-developed, performance-based learning objectives and authentic assessment. Bringing in perspectives from external stakeholders is often seen as a way to enhance curricula and help to ensure their relevance to the job market demands.

In the field of logistics management, we have witnessed far-reaching developments in recent years due to globalization and rapid technological progress. These fast-paced changes impact and streamline supply chain management in organizations worldwide, thereby creating an acute need to adapt academic courses that prepare logistics managers to tackle the challenges posed by the industry. Gibbs (1995) suggests to integrating action research projects into curricula development. (Arnold & Norton, 2021) and (Riding et al., 1995) encourage the use of action research specifically in graduate and postgraduate studies, and in areas where an understanding of complex social situations is needed to improve the quality of teaching.

This study focuses on the experiences of developing a curriculum for undergraduate students in the field of logistics through the action research method, by describing the development of a basic undergraduate course, Fundamentals of Logistics. This course is taught in the first semester of the Management and Logistics Program, and the variety of

topics as well as the required mathematical skills pose significant challenges for both students and teachers. For the students, this is their first exposure to academic demands and structure. Meanwhile, teachers must ensure that strict academic requirements are met while encouraging students to continue in this field. In coping with these challenges, the authors faced three interrelated issues while teaching the course: the heterogeneous character of the student body; topic selection and logical flow of topics; and the unique function fulfilled by the course.

2. Literature Review

The literature review includes several parts. First, we address issues in developing logistics programs. Second, we describe attitudes to academic curriculum development. In the last section of the review, we present the action research practice.

2.1 Issues in Developing Logistics Courses

Unlike some academic areas, the field of logistics and supply chains has evolved directly from "real world" requirements (Castronova, 2002). As such, the importance of the connection between theoretical studies and practical approaches cannot be overemphasized (Lau et al., 2018). Particularly, there is a major debate regarding the extent to which higher education manages to remain up-to-date with the rapidly evolving needs of the industry (Gámez-Pérez et al. 2020).

An analysis comparing the contents of an academic course to employment requirements revealed that academia failed to adjust to the pace of changes and did not equip students with the skills required for success in this profession, such as interpersonal communication practices, and research and system analysis (Fawcett & Rutner, 2014; Sinha et al., 2016; Wong et al., 2014). Moreover, as in other academic studies, logistics teaching methods are mainly based on lectures and memorization, and less on practical experience, even though students benefit most from the latter approach (Woschank & Pacher, 2020; Xu-yang & Jing, 2011).

To ensure an effective learning experience, industrial and commercial activities should be simulated closely, for example via hands-on training on widely used logistics software and hardware (Angolia & Pagliari, 2018; Sweeney et al., 2010). Moreover, lessons should ideally be taught by lecturers with practical experience (Xu-yang & Jing, 2011). As it is often difficult to satisfy these best practices, the educational potential is often not fully realized. Over the years, as the dominance of logistics and supply chain management (SCM) in the operations side of organizations has increased, calls to include these fields in the curriculum of academic studies have grown (Sun & Song, 2018).

Articles that analyzed academic programs in logistics and SCM focused on the entire curricula by examining their syllabi and distributing questionnaires to students and potential employers (Fawcett & Rutner, 2014; Gámez-Pérez et al., 2020; Romanovs & Merkuryev, 2019; Sun & Song, 2018; Wong et al., 2014). Still, very little documentation exists in academic literature regarding the development of a single course in the fields of logistics and supply chain management. The literature refers mainly to SCM courses or to the impact of integrating commercial software in courses, without addressing action research methodology (Angolia & Pagliari, 2018; Grasas & Ramalhinho, 2016; Romanovs & Merkuryev, 2019; Sweeney et al., 2010; Verner et al., 2013; Woschank & Pacher, 2020).

The uniqueness of the current study is that it focuses on a single course, which serves as the gateway to a sequence of BA courses in logistics at an Israeli college. The course contents, teaching sequence and issues discussed were adjusted over several years, based on the lecturers' experience and feedback from students. The adjustments made it possible to improve the benefits students derived from the course, both in terms of acquiring concrete knowledge and the motivation to continue studying in the program.

2.2 Curriculum Development in Academic Education

The literature considers Taba (1962) as one of the first educators who applied the modern paradigm's principles in curriculum development, which means to define the learning goals for a particular discipline and determine the content suitable for achieving them. Bobbitt (1971) criticized Taba for conceptualizing the curriculum development process as a predictable action meant to achieve a concrete product, and called for developing teaching activities that will enable students to learn the needed material. Subsequent research suggested that specific actions should be carried out in a particular sequence, to plan instruction and provide a curriculum development model in cases where the contextual basis was missing (Lunenburg, 2011; Saban, 2021).

Pinar (2014) then suggested a different method, emphasizing curriculum development from the postmodern point of view. This encouraged curriculum developers to explore new ways of thinking that will enable them to view the curriculum and its creation as an ongoing process. According to Pinar, the postmodern approach focuses on "relations" that arise when practitioners come together to understand and improve the curriculum, rather than

focusing on a particular sequence of steps (Saban, 2021). Other research emphasized issues such as distinguishing between teacher-centered and student-centered understanding or "conception" of teaching (Åkerlind, 2008), or integrating one's conception of teaching with his or her epistemological stance (Sangpikul, 2017).

With a teacher-centered approach, educators' attention is focused on what they, as teachers, implement in any teaching/learning situation; with a student-centered approach, attention is focused on what the students are experiencing in any teaching/learning situation and considers the potential impact of teachers' actions upon student experience. According to Kerlind (2008), a student-centered understanding focuses on the impact on both teachers and students in teaching and learning situations. A student-centered approach emphasizes awareness of the potential for variation in different students' reactions. In contrast, a teacher-centered understanding only focuses on the teachers' side, with expected student reactions taken for granted.

2.3 Action Research Practice in Curriculum Development

According to (Kemmis, 2009), action research aims at changing three aspects: practitioners' practices, their understanding of such practices, and the conditions under which they operate. In its broadest sense, this concept refers to the research efforts performed by practitioners in solving the problems that they encounter in their fields of study. Action research calls for problems to be examined by practitioners who experience them, rather than by outside experts (Aksoy, 2003).. Moreover, action research calls for a systematic and continuous process consisting of specific stages.

Notably, these stages do not follow a constant, known-in-advance structure, but have the flexibility to be changed during the research. That is, stages in the action research process are revertible, and, if necessary, some can be removed, replaced, or skipped simultaneously (Kuzu, 2009). The action research cycle of review, plan, act, and evaluate has been articulated in various ways by several writers in the field of education generally (Alber, 2011; Clausen & Black, 2020; Elliot, 1997; McNiff, 1988; Zeller-Berkman et al., 2020).

In particular, this approach to curriculum development has greater potential for bringing about change in higher education than research carried out by outsiders whose conclusions are often unknown to or ignored by practitioners (Burchell, 2000; Zuber-Skerritt, 1994, 1996). According to (Riding et al., 1995), action research is critical in the sense that practitioners not only look for ways to improve their practice within the constraints they face, but are also critical change agents of those constraints, and of themselves. Thus, action research is reflective in that participants analyze and develop concepts and theories about their own experiences.

A specific emphasis has also been put on action research to understand and improve the curriculum in a specific context (Clandinin & Connelly, 1992; Jackson, 1992). Elliot (1997) suggested action research to solve a problem situation related to the practical curriculum. In a later work, Saban (2021) differentiates between modern and postmodern paradigms in curricula development. Whereas the modern paradigm has been associated with the widespread use of quantitative research in education, the postmodern paradigm has been characterized by the dominance of qualitative research.

Millwood and Powell (2011) contend that action research approaches have frequently been explored as a means of identifying strategies for curriculum development at an institutional level. Such approaches seek to develop a framework to provide faculty members with the insights necessary to inform effective curriculum design. A five-stage, teacher-led action research model for developing a professional course was suggested by (Lambirth et al., 2021). The stages and issues to be considered in this model are: (1) "defining the field of action" (i.e., professional concerns, focus area) (2) "planning" (i.e., research skills, critical thinking) (3) "action" (i.e., contextual power relations, ethical awareness) (4) "evaluation" (i.e., peer review, practical implications) and (5) "reflection" (i.e., transformation, sustained change).

Saban (2021) summarizes the theoretical dilemma in curriculum development to the question of how to overcome the problems inherent in traditional approaches, while also focusing on applying educational practices. The proposed curriculum development model he suggested consists of a cyclical problem-solving process employing six stages: (a) identifying the focus area (b) performing a needs analysis (c) developing an action plan (d) implementing the action plan (e) evaluating the process, and (f) reflecting on the process. He claims that the best way to improve practical curriculum is through action research. The reason is that both processes – curriculum development and applying educational practices – aimed to improve educational situations or overcome educational challenges.

Based on the literature reviewed, our hypothesis was that the action research approach to logistic curriculum development can contribute very positively to the quality of logistic teaching in higher education. Thus, we used this approach while developing a basic course, Fundamentals of Logistics. This paper describes and summarizes our

experience.

3. Research Frame

3.1 Course Framework

A northern Israel college offers a BA degree in management and logistics. This is an intensive 3-year program (9 semesters over 108 weeks) aimed at meeting the Israeli industry's demand for skilled logistics employees. The program offers 45 courses, 23 in management and 22 in logistics.

The first course directly connected to the logistics world is Fundamentals of Logistics, an introductory course for many logistics classes. Thus, students must enroll in it in their first semester. The purpose of the course is to introduce the students to the vast world of logistics. It is done by briefly discussing as many topics as possible, combining fundamental topics from logistics textbooks (Blanchard, 2010; Langford, 2007; Martin, 2016; Sople, 2012) with issues drawn from hands-on experience. Most of the topics covered in this basic course are then studied in more depth in subsequent courses.

3.2 Timeline and Course Contents

The authors taught the course three times in three successive years: 2018, 2019, and 2020 (The semester ended just before the outbreak of the COVID-19 pandemic). The rationale for the first-year teaching sequence was to cover logistics issues in a way that imitates the real-world supply chain. That is, starting with production planning topics (reliability, availability, maintenance), continuing with supply chain topics such as inventory management and procurement, and ending with delivering products to customers (transportation, location of warehouses, etc.). Interdisciplinary strategic issues, such as life-cycle cost, Pareto principle, lean logistics and constraint theory were discussed in between these three main groupings. Slight adjustments were made in 2019, specifically regarding the time allocation for each topic, but significant changes were made in 2020, as a response to student feedback, particularly referring to topics sequence and teaching methods.

3.3 Students' Background

Students in the program came from diverse backgrounds. Many are blue-collar workers with practical experience in one or more logistics areas who feel that they need formal education to upgrade their position and status in their current jobs. These students usually combine studying and working and can take only afternoon and evening classes. Other students are younger and inexperienced and enroll in the program to boost their career prospects: Some of them hold jobs that have little or nothing to do with logistics, while others do not work at all or hold part-time student jobs. Table 1 presents the number of students enrolled in the course each year and their professional background. Notably, the number of students varied sharply each year, and most students were employed, but not necessarily in the field of logistics.

Table 1. Professional background of students in the courses

Class (year)	Total number of students	Students working logistics-related jobs	Students working jobs not related to logistics	Students who do not work
A (2018)	58	21 (36%)	25 (43%)	12 (21%)
B (2019)	22	13 (59%)	8 (36%)	1 (5%)
C (2020)	51	27 (48%)	23 (38%)	1 (11%)

3.4 Challenges

The authors faced three interrelated challenges while teaching the course. The first was the heterogeneous student population. The second was the topic selection and teaching sequence. The third challenge was the unique role this course fulfills in the program.

The literature widely discusses the challenges of teaching a heterogeneous student body. Issues such as class size (Bandiera et al., 2010) and adapting the teaching level to different groups in the class are analyzed (Asseburg & Frey, 2013; Kärner et al., 2021; Sweller et al., 2019). In our case, we recognized two main difficulties, as discussed hereafter.

The first difficulty was to bridge the divergent levels of expertise among students in various logistics issues. For some students, the world of logistics was brand new, while others had experience in specific logistics aspects through their work, or a strong connection to practical logistics during their careers. This required careful maneuvering to

ensure that inexperienced students are not lost, and that more experienced students are not bored and losing interest. The second difficulty was linked to the mathematical background of the students. Although all of them had to meet specific threshold requirements, there were considerable differences in their math capabilities and ability to handle analytical models.

The second challenge was the choice of topics to be discussed in the course. Although we used textbooks as references, we had some flexibility as, , the area of logistics is wide and varied, and because its structure may be non-hierarchical, i.e., preliminary knowledge of one topic is not necessarily essential for studying another topic. This presented several dilemmas such as which topics to include, which subjects to focus on under each topic, and what is the preferred teaching sequence. Moreover, some topics required certain mathematical skills, forcing us to adjust to the uneven skill set of students. More specifically, we had to balance between adhering to strict academic standards and motivating struggling students to continue in the program.

For example, production planning, which was the first topic we taught in the first year, required a background in probability. Thus, a brief review of it was presented in the second lecture. Alas, it turned out that students faced serious difficulties in handling this topic. Moreover, it elevated student concern regarding subsequent course content. This was reflected during the lecture itself and in the feedback forms (see examples in the Findings section).

We tried to address this issue in the second year by doubling the time allocated to this topic from three to six hours. Although this change did improve student comprehension, it did not mitigate student concern and doubt regarding the necessity of this subject to the course. Moreover, the extra time devoted to this topic came at the expense of other subjects. In the third year, we decided to postpone these core topics of production planning to the last part of the course. This dramatically improved student satisfaction, as shown in the Findings section.

The third challenge was related to a broader aspect of the bachelor's degree in logistics, which is perceived by students as very challenging and demanding. This required us to leverage this first course to motivate students and strengthen their resolve to continue in the program despite the difficulties. Different versions of this challenge were reviewed and analyzed in previous studies, mainly related to mathematics (Kärner et al., 2021; Sweller et al., 2019; Verner et al., 2013).

There is tight linkage between these three challenges. In particular, the topics of study and the order in which they are taught are influenced by the group's heterogeneity and the "*showcase*" role the course plays. The fundamental knowledge of the students affects the scope and depth of the subjects studied and the preferred educational techniques to keep them interested, and so on.

3.5 Coping with the Challenges

The challenges presented in the previous section are widely discussed in the literature on both aspects: industrial market needs and pedagogic teaching considerations (Asseburg & Frey 2013; Kodzi 2019; Lutz et al., 2022; Niine & Koppel 2014; Salinas-Navarro et al., 2020; Sangpikul, 2017; Trautrims et al., 2016; Walden 2020). To overcome these issues, together with the ambition to make the course more attractive for students without giving up academic requirements, we decided to make some changes to the curriculum to make it more relevant and interesting. These adjustments were minor in the second year but more significant in the third year, as we gained more insights. Notably, we emphasized the relevance of the selected topics to real-life situations in the job market. Thus, the main pedagogic methods we used were as follows:

1. **Using updated media resources (video clips, news articles, etc.) while discussing course topics**. In addition to boosting student interest, this had another important advantage, highlighting the fact that these topics were not theoretical but practical. For example, while teaching the Pareto Rule, students were presented with a press release on actual tax rates in Israel. Similarly, in teaching ethics principles we analysed authentic ethics documents posted by organizations online. While teaching LEAN management, we watched a short video demonstrating the topic in a real-world pizzeria and discussed its process.
2. **Introducing new topics via in-class activities**. Studies performed in the field of logistics and supply chain management show that active learning is an effective educational tool compared to traditional education techniques (Angolia & Pagliari 2018; Tzimerman et al, 2013, 2016; Woschank & Pacher 2020). Thus, we increased the students' involvement in class. This was done by giving in-class assignments (individual or group work) and discussing their broad connotations only after completion. This method offered several advantages: boosting students' curiosity, producing high involvement and interaction, and providing opportunities for students to work together intensively and informally.
   For example, we introduced the topic of LCC (Life Cycle Cost) by presenting the following dilemma: "Which

car should Ms. Caz buy if she has two alternatives, and the leading consideration is financial?" This dilemma was discussed in groups of three students who had to consider and estimate the relevant expenses. After 15 minutes of group work, we reviewed the results with the whole class. This discussion helped students realize that purchase price is often not the main parameter an organization should consider when determining a system's life cycle cost. We only presented and taught a formal definition of LCC after the initial assignment.

3. **Leveraging class heterogeneity**. As noted, the program attracts students with varied levels of experience and from different professional backgrounds. Previous studies show that such heterogeneity has an enriching learning potential (Farahani et al., 2019; Millrood 2002; Rothenberg et al., 1998). Thus, we used this feature to give students with professional experience the opportunity to share relevant field dilemmas with the class. This boosted student involvement and further demonstrated the tight connection between course topics and real life, as well as the practical skills gained in the program.
4. **Linking assignments to the real world**. Towards the end of the semester, the students had to choose an organization and collect information about it. Based on this information, they considered and analyzed some of its logistics challenges and discussed of ways of coping with them. A key purpose of the project was to boost student awareness of the importance of logistics for organizations. Moreover, starting in the second year, the final exam included one question related to a relevant real-world situation or event. For example, government preparations for extreme weather and flooding, or the logistic aspects of organizing national elections.

3.6 Data Collection and Analysis Techniques

To receive student feedback, we asked the students to fill out an online survey. The survey included seven Likert-type questions and an open-ended question where students could write freely about their experience. The answers were collected automatically and analyzed using Excel.

3.7 Ethic Aspects

In order to ensure maximum confidentiality and prevent the influence of the students' desire to impress the course lecturer when answering the questionnaires, two actions were taken. First, the questionnaires were anonymous, thus preventing the identification of the respondent. Second, the questionnaires were sent to the students only after they received the final grade of the course.

4. Findings

Table 2 presents the average results of the Likert-type questions, followed by analysis of the open-ended question. The results reveal that the average ranking in the second year compared to the first improved only in basic aspects such as clarity of goals and requirements (question 2), and teacher attitude (question 5). However, ratings of core aspects in the course remained unchanged or even deteriorated. In contrast, the rankings in the third year improved significantly across the board. We assume that the order we taught the course had a significant effect on this finding.

Table 2. Survey results (1-5 scale)

Question		2018	2019	2020
1.	Were the goals and requirements of the course clear?	3.79	4.00	4.12
2.	Did the teacher encourage active learning and involvement?	3.50	3.43	4.20
3.	Were the lectures well organized?	4.24	3.88	4.31
4.	Was the teacher's attitude fair and respectful?	4.43	4.56	4.63
5.	Did the learning process encourage independent thinking?	3.85	4.07	4.29
6.	Was the course intriguing and interesting?	3.73	3.53	4.12
7.	Did the course provide you with relevant knowledge on the subjects studied?	3.83	3.75	4.47
	Total average	3.94	3.93	4.31
	Total number of students (see Table 1)	58	22	51
	Number of answered surveys - (% of students)	42 (72%)	17 (77%)	51 (100%)
	Number of answers to open-ended question (% of answered surveys)	19 (45%)	2 (12%)	31 (61%)

In the first two years we started the course by teaching a mathematical subject whose relevance to the field of logistics became clear only at a later stage, and as a result, the initial expectation of students was that the course would be theoretical and not very interesting. Apparently, this impression remained unchanged throughout the whole semester. In the third year, however, we opened the course by teaching topics that were at the core of logistics and clearly connected to the real world, while moving the mathematical background and related content to the end of the course. As a result, the more "threatening" topics were learned only after the students had already developed some enthusiasm for the course subjects, while also boosting their math skills in other courses taught in parallel. Overall, restructuring the course had greatly improved the student experience, as shown in the survey results.

As to the open-ended question, only 19 students (45%) answered it in 2018. Although 16 were mostly positive, they complained that the topics taught were too difficult and that the practical component was insufficient. The other three responses were very positive. Some of the responses received from students are listed below:

- Excellent course. In my opinion, more attention to quantitative exercises is needed.
- Need to add more mathematical practice.
- The course is difficult but interesting.
- Unfortunately, I missed some classes during the semester, but the classes were very interesting and gave me a sense of our future courses.
- The math was too difficult for me.
- The course itself was quite difficult.
- A very important course. It helps to understand what logistics is.
- Throughout the semester the topics felt very vague. I did not know how to practice them.
- The course was interesting. It developed my general understanding that it is possible to improve processes at my job and make them more efficient and effective.
- Very interesting course. It taught me a lot and gave me many practical tools.

In 2020, 31 students (61%) answered the open-ended question. Among them, 7 students criticized the course, complaining that there were too many topics and they had trouble keeping up. Despite the criticism, three of them ranked the course 4.11 and above. The other 24 open-ended answers included very positive feedback on the course. Specifically, the feedback from students who had jobs in logistics highlighted immediate practical benefits. Here are some examples:

- The course was very interesting. It contributed to my job. I can implement what I learned.
- The course is very interesting and exhaustive. Although I have 10 years of experience in "real-world" logistics, I implemented some lessons in my job.
- I have learned many new things that I intend to implement in my job, which is logistics oriented.
- Some topics were directly connected to my position at work. I learned a lot.
- The course caused me to develop the way I analyze processes, and to think about how to improve efficiency at my work.
- The course is superbly constructed, and the topics are taught practically.
- The course was very practical in many areas. As a person who works in the field, I have learned a lot and improved my inventory management skills. The course expanded my view of the logistics world.

Some feedback from students with no background in logistics is given below:

- It was a challenging course, which required a different way of thinking than I am used to. During the semester I realized the complexity and importance of the logistics field.
- I think that this needs to be a mandatory course, as it provides plenty of knowledge about the field of logistics.
- Must note favorably the creation of interest in classes - the group activities, videos and real-world examples all created interest and connected the lessons to the real world. Thank you so much for the interesting lessons.
- I feel that the course provides an excellent entry point into the field of logistics and the subsequent courses.

- It was one of the most interesting courses I had participated in, particularly because I intend to develop a career in the field.
- I had no idea that logistics deals with such a wide spectrum.

As can be seen in Table 3, there was no correlation between the logistics background of students and the type of feedback. This suggests that the topics of study and teaching methods worked equally well for the two groups. This was the case regardless of their different levels of experience and familiarity with logistics.

Table 3. Feedback distribution (students that answered the open-ended question)

	2018			2020		
	Enthusiasm	Concerned	Total	Enthusiasm	Concerned	Total
Logistics background	2	8	10	12	4	16
No logistics background	1	8	9	12	3	15
Total	3	16	19	24	7	31

5. Discussion and Conclusions

The paper presented a case study of developing a syllabus for an academic course in logistics while coping with three challenges: class heterogeneity, topic selection and course structure, and course positioning within the broader program. Based on previous studies (Arnold & Norton, 2021; Burchell, 2000; Elliot, 1997; Riding et al., 1995), our hypothesis was that action research approach can contribute very positively to the quality of this process. Thus, our study focused on creating a curriculum and learning environment for undergraduate students based on the action research method. We used this approach in three successive years, restructuring the course and modifying our teaching methods based on student feedback and our experiences during classes.

Based on the results, we conclude that the final structure of the course met the students' expectations. They seemed to appreciate the exposure to many different topics and found them relevant to real-world situations and processes. Moreover, both experienced and inexperienced students shared a similar interest in the course topics. Notably, students who had a professional background in practical logistics often expressed more enthusiasm. In addition, many students were surprised by the breadth of the world of logistics, which reinforced their choice to study the subject.

Our results encourage curriculum developers in academic institutions to explore new ways of thinking that will enable them to view curricula and their creation as an ongoing process. Moreover, instructors would be well advised to emphasize a student-centered approach to academic teaching and curriculum development that calls for acute awareness of the potential for variation of students' experience and abilities.

One limitation of the study has to do with the questionnaire, as three of the questions included two components to be answered, whereas the Likert-type scale should include a single component. Such wording is usually confusing and thus may cause a validity issue. Still, the high scores that these questions elicited, as well as the accompanying answers to the open-ended questions, reduced those concerns. Nevertheless, in a future study we will aim to elicit student feedback using more precise questionnaires.

Our analysis of the curriculum development process applied in our courses corroborates Saban's (2021) arguments that a practical curriculum can be substantially improved through action research. This further highlights the importance of developing an institutional framework to provide faculty members with action research insights and tools for effective curriculum design, as suggested by (Millwood & Powell, 2011).

However, action research has some potential disadvantages that should be considered. The main one is the lack of repeatability - i.e., many parameters such as the student body vary each time the course is taught. We aimed to address this by applying a four-stage spiral process – plan, act, observe and reflect – repeated for three successive years to obtain a wider scope of results.

In summary, our experience of coping with the three abovementioned challenges during the course development process was very intensive and enriching. Most importantly, we learned that class heterogeneity enhanced the value of the course. However, to derive the full benefits of this diversity, we had to be more versatile in selecting and

organizing course topics, and more creative in teaching the material. In parallel, the wide range of topics in the logistics field, and its dynamic environment of innovation and change, drove us to combine "trendy" topics with more fundamental basics. Integrating real life examples and case studies for both types of topics seemed particularly important in this respect.

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