

Logistics and supply chain training model through gamification

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Abstract: Interactive learning models in higher education have a number of advantages, helping to maintain students' interest in the discipline being studied. Engaging students in the learning process has become increasingly important since the Covid-19 pandemic. The concept of gamification in logistics education is not new, but is increasingly gaining popularity. This paper presents a model for learning logistics and supply chains through gamification and describes the benefits of using gamification to increase student engagement and activity.

Keywords: gamification, logistics, supply chains, learning

JEL: F630, L90, R41

1. INTRODUCTION

Logistics and supply chains training can be viewed as a process in which learners consciously and systematically acquire knowledge of planning, implementing and controlling the execution, efficient movement and storage of products, services and related information from the point of origin to the point of consumption. The logistics concept integrates the management of the various processes and activities that facilitate the flow of materials, and computer technology and software are factors that have a significant impact on logistics management. The development of computer technology allows logistics to be implemented and managed much more efficiently. Learners can acquire knowledge related to key business processes from the end users through the original suppliers who deliver the products, services and information that add value to the users and other actors and acquire the skills and habits to master the knowledge independently and to apply it in practice, developing their capabilities. When managing projects that are applicable to the logistics sector and those that are supply chain related, solutions can be sought in the areas of logistics, international freight, inventory management and warehouse space.

In recent years, the game-based learning model has increasingly found application in higher education. The main characteristic of the educational game is the fact that the learning content is diluted with the game. The aim of this paper is to create a learning model of business logistics and supply chains by revealing the game elements in learning and gamification and to reveal the benefits of using gamification.

2. Literature review

The term "gamification" is the application of game-based elements to various systems that can serve as training. According to Landers and Callan, gamification is not

just playing for learning purposes, but applying "the motivational properties of games by building on learning activities, integrating the human desire to communicate and share, increasing achievement with goal setting, and directing student attention toward motivation" (Landers, R. N. & Callan, R. C., 2011, p.2019)

Darius Ašeriškis, Robertas Damaševičius describe the psychological foundations and social motivations for play, its principles and concepts, rules of play (mechanics) and elements of play, as well as techniques and patterns of play. They examine and analyze a game on the Trogon Project Management System (PMS), which is based on the three-layer architecture. As a conclusion, they found that users who did not specialize in the IT sector rated the usability of the project management system lower.

Reiners and Wood develop a framework that combines several game elements that can be relatively easily incorporated into existing training methods for logistics and supply chains. The elements aim to increase engagement and extend active learning. (Wood, L. C., & Reiners, T., 2012)

Marko Urh, Goran Vukovic, Eva Jereb, & Rok Pintar (2015) present a model for introducing gamification in e-learning in higher education. The model they present includes basic elements in e-learning and describe the reasons that most often occur as shortcomings in e-learning. (Marko Urh, Goran Vukovic, Eva Jereb, Rok Pintar, 2015)

In recent years, gamification has become a new form of interactive content that is suitable for use for learning purposes not only offline but also online. Universities can develop innovative teaching methods to provide lifelong learning concepts to. Gamification can enhance teamwork in project management as well as enable other soft skills such as responsibility, creativity, micro entrepreneurship, corporate culture etc.

The use of gamified elements on logistics and supply chains can be an integral part of training. Creating game elements for learning is essential in building this complex system of interconnections that the supply chain encompasses. To realise the optimal impact of these interconnections and relationships, it is necessary to consider the internal and external structure of the game.

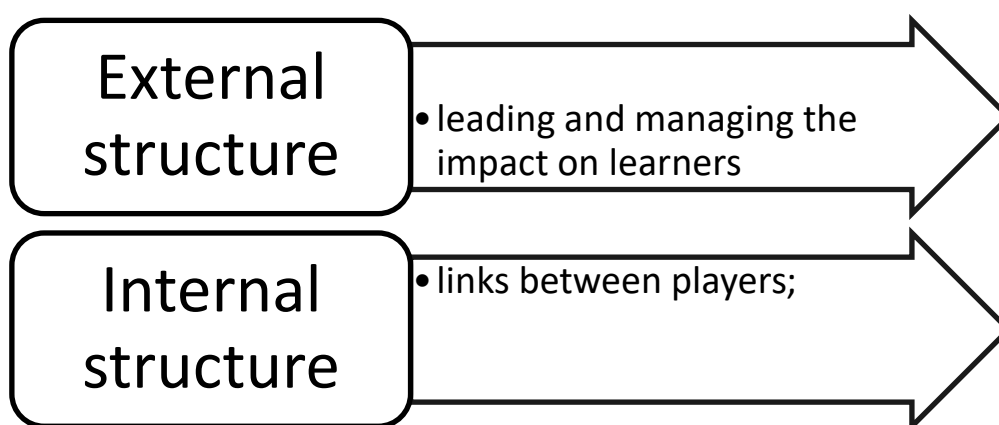


Fig.1. Structure of the learning game

Source: Own data

The design of the external structure of the game should create an optimal option for guiding and managing the impact on learners, while the internal structure of the game includes the relationships that are built between the players, the opportunities for skill acquisition during the game actions, and the regulation of students' behavior in the game. The internal structure enhances students' motivation and satisfaction towards learning the relevant subject, it also creates social interaction. Blohm Leimeister has made a comparison between the game definition elements to be simulated and the reasons associated with each type of element according to the mechanical and dynamic perspectives, which is presented in Table 1. (Blohm, I.J. M. Leimeister, 2013)

Table 1.: Elements of game definition and their motivations

Motivation	Game Definition Elements	
	Game Mechanics	Game Dynamics
Intellectual curiosity	Behavior documentation	Exploration
Achievement	Rating and reward systems	Collection
Social recognition	Ranking	Competitions
End Goal	Levels	Status Acquisition
Social exchange	Group tasks	Collaboration
Cognitive stimulation	Pressure and challenge	Challenge
Self-Determination	Characteristics and Global/Virtual Trade	Development/ Organization

Source: (Blohm, I.J. M. Leimeister, 2013)

The relationships between learners during the game elements are related to the rules of the game and to the position the student occupies (buyer, planner, supplier, distributor, inventory management manager, etc.). The game roles guide the learner towards accepting the position they occupy by following the rules. Relationships emerge as a result of interaction and negotiation between participants and are related to the course of the game, assigning roles and responsibilities, specifying rules, regulating the sequence of game actions, etc. These relationships are linked to the principles and norms of behaviour that are actually manifested.

The application of the game-based approach in logistics and supply chain training is characterized by the following features:

1. the place of play and its extreme importance for the Alpha generation expected to enter universities soon;
2. the link between the game and the curriculum requirements for skills and competences;
3. the formation of the requirements for the Bachelor's and Master's degrees;
4. knowledge formation (theoretical and factual);
5. skills formation (cognitive and practical);
6. formation of competences (autonomy and responsibility, key competences for lifelong learning, language learning, civic and social competences, digital competences, communicative competences, professional competences), in accordance with the National Qualifications Framework¹ and the European Reference Framework of Key Competences for Lifelong Learning²;
7. the role of the game in making global themes implicit in logistics and supply chains training;
8. the role of the game in the effective implementation of the specificities of the subject at Bachelor and Master level;
9. practical orientation and creativity on the part of students;
10. the problem-orientation of learning situations.

The internal and external structure of the game elements in logistics and supply chains training need to interact and be equivalent, since the external structure influences the course of real game interactions only when the learners are prepared and have the necessary knowledge.

3. A MODEL FOR INTRODUCING GAMIFICATION METHODS DURING ONLINE TRAINING IN BUSINESS LOGISTICS AND SUPPLY CHAIN

There are numerous models for gamified learning in the literature. For the construction of the presented model for training in business logistics and supply chains, the following two models are based:

- Event-Oriented Design Model (EODM) for Web-based learning was described by Welsh in 1997. This model has three main elements that characterize it:
 - asynchronous and synchronous learning;
 - specification of the objectives and the learning strategy;
 - specification of the information technologies that are most appropriate for achieving these objectives.

¹ The National Qualifications Framework of the Republic of Bulgaria (PMS № 96 / 02.02.2012) defines the knowledge, skills and competencies that are required as a result of training in the respective educational and qualification degrees in higher education.

² The European Reference Framework for Key Competences for Lifelong Learning (Official Journal of the European Union C 189/7 4.6.2018) defines eight key competences needed for personal fulfillment and development, employability, social inclusion, sustainable living, successful life in peaceful societies, organization of life in a healthy way and active civic participation.

- **Activity-Oriented Design Model (AODM)** Activity-oriented design methods based on activity theory can be used to develop a more holistic understanding of collaborative knowledge building practices among course design teams and their students.

The model developed summarises the key features of EODM and AODM, with the aim of enhancing the effectiveness of the business logistics and supply chains learning process by realising the educational objectives and enhancing the quality of teaching and learning activities. Business Logistics & SC education Design Model (BL&SCEDM) includes the following elements: (Fig. 2)

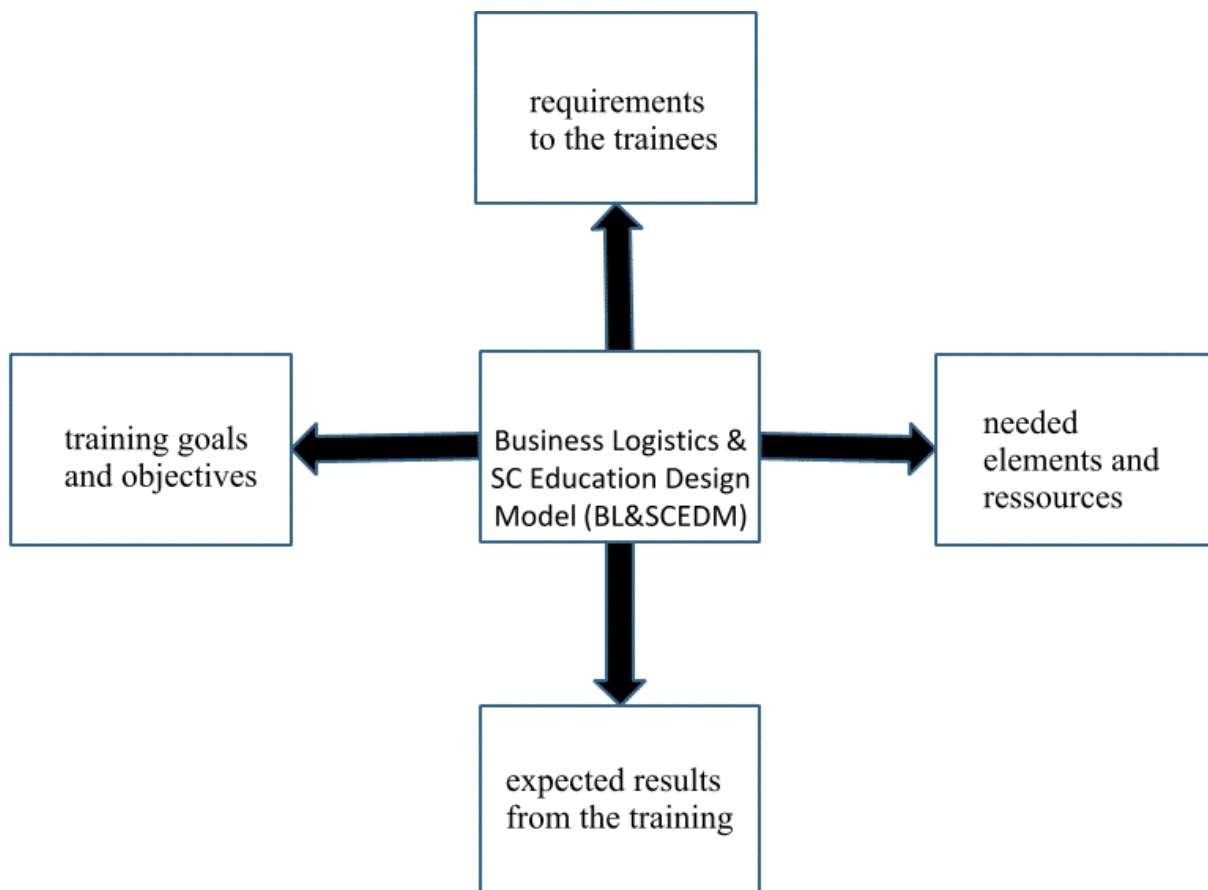


Fig.2. Business Logistics & Supply Chain Education Design Model (BL&SCEDM)

Source: Own data

Identification of trainee requirements - basic knowledge of logistics and supply chains is required.

Learning goals and objectives - adding new knowledge, skills and competencies. For a training to be effective there needs to be clear objectives and targets. The most common factors contributing to project failure are: unrealistic or inarticulate project objectives, inaccurate estimates of resources required, poorly defined system

requirements, poor project status reporting, unmanaged risks, poor communication between customers, developers and users, use of outdated technology, inability to handle project complexity, poor development practices, poor project management, stakeholder politics and commercial pressures

Required elements and resources:

- Provision of specialist literature on business logistics and supply chains (or access to texts, presentations and other materials);
- Providing a playbook;
- Help with questions that arise;
- Managing course work;
- Questions concerning various activities in the course;
- Opportunity for feedback;
- Tutor's guidance;
- Provision of Web-links (if needed).

Expected learning outcomes

The development of new knowledge includes theoretical and factual knowledge of business logistics and supply chains, skills - cognitive and practical and competences - autonomy and responsibility, key competences for lifelong learning, language learning, civic and social competences, digital competences, communicative competences, professional competences.

The model provides students with the following basic knowledge:

- define project management, the evolution of logistics project management;
- define models of logistics project management;
- understand the importance of supply management in logistics project management;
- understand the importance of communication management in logistics project management;
- identify the factors influencing the project management process and know the sources of funding;

The model provides students with the following basic skills:

- identify the constituent activities of the planning process, compile network schedules, and apply CPM and PERT technologies in network analysis;
- understand project cost analysis, budgeting and pricing and perform project estimation.

Benefits of using the Business Logistics & SC education Design Model (BL&SCEDM)

4. BENEFITS OF USING BUSINESS LOGISTICS & sc EDUCATION DESIGN MODEL (BL&scedm)

The benefits are primarily related to the acquisition of new knowledge and skills through increased student motivation using real situations, scenarios and challenges.

Students find meaning in learning and engage in learning important skills and content. Bialystok (Bialystok, L., 2021) uses the term authenticity to track the credibility of educational practice in relation to external reality. According to him, "the relationship between academic lecture and 'real' life gives rise to the need for authentic learning". (Bialystok, L., 2021)

There are a number of benefits of using learning models described in the literature. Those applicable to logistics and supply chain education and to the Business Logistics & SC Education Design Model (BL&SCEDM) are presented:

1/ Prepares students for real business life by presenting real situations, case studies and tasks that perform logistics activities.

2/ Helps students make informed career choices by presenting the various applications of logistics and supply chain. On the one hand, students can work in the logistics sector, and on the other hand, they can work in commercial and manufacturing enterprises that perform various logistics activities.

3/ Enhance creativity which includes creative thinking. An important feature of the gamification-based learning model is that there are multiple possible outcomes or solutions to a problem rather than one right answer, which can encourage students to ask questions and think outside the box. Instead of worrying about whether they will be able to give the right answer to a problem, students learn to develop multiple solutions to a problem by exploring problems from different perspectives, using different resources.

4/ Improves critical thinking. Guiding students to make decisions independently while performing logistical tasks can greatly improve their critical thinking skills. When students are encouraged to think and make their own decisions, they are able to learn more consciously and gain richer experiences.

5/ Increases engagement and motivation. The logistics and supply chains learning model is appropriate for students because it can show how it applies theory to the discipline being studied. A number of studies have shown that when learning is relevant to students, it is also more effective. Also the next generation of Alphas expected to enter universities will expect efficiency from learning.

6/ Increases retention of information. When students understand the importance of the work they are doing and are given a chance to apply the knowledge, they are much more likely to remember what they have learned and use it again in the future.

7/ Encourages collaboration and teamwork. The gamification-based training model for logistics and supply chains requires collaboration and teamwork, just as most real-world tasks do. Students will learn to communicate more effectively while discussing possible problems, making joint decisions, and working together.

8/ Helps build knowledge, skills and competencies. The learning model is an effective way of helping students develop important skills, knowledge and competencies such as numeracy, critical reading and fact checking.

4.1. References

Bialystok, L., 2021. Authenticity in Education. Oxford University Press.

Blohm, I.J. M. Leimeister, 2013. Design of it-based enhancing services for motivational support and behavioral change. *Business & Information Systems Engineering* 5, 275–278.

Landers, R. N. & Callan, R. C., 2011. Casual social games as serious games: The psychology of gamification in undergraduate education and employee training. In: Ma, M., Oikonomou, A. & Jain, L. C. (eds.) *Serious Games and Edutainment Applications*. Springer London.

Marko Urh, Goran Vukovic, Eva Jereb, Rok Pintar, 2015. The model for introduction of gamification into e-learning in higher education. 7th World Conference on Educational Sciences, (WCES-2015), Novotel Athens Convention Center, Athens, Greece.

Wood, L. C., & Reiners, T., 2012. amification in logistics and supply chain education: Extending active learning. In P. Kommers, T. Issa, & P. Isaías (Eds.) (Presented at the International Conference on Internet Technologies & Society). IADIS International Conference on Internet Technologies & Society 2012, Perth, Australia.

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