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# Dual Lex: applying logistics strategies in the educational process

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This article discusses the landscape of education. The challenge lies in harmoniously blending the directive PUSH strategies, which focus on structured guidance, with the exploratory PULL methods, centered around the learner's initiative. To illustrate this, the realms of science and art as examples are used, showcasing how these strategies can be interpreted and applied in different educational contexts. The educational systems of selected countries are considered from the viewpoint of the novel framework involving PUSH and PULL methodologies in the delivery of education. China's emphasis on a structured and orderly educational process, Finland's dedication to student autonomy and flexibility, and the UK's integrative, hybrid model. Nevertheless, there is still a need for a cohesive approach that effectively combines the structured science education methods with the more fluid and interpretative methods used in art education. This paper deals with a comparative analysis of how educational systems in China, Finland, and the UK navigate the PUSH-PULL dynamics. In this article, we propose and develop a new model for understanding the role of students in the educational system. This model, which we are introducing, views the student in a dual capacity: as both an integral part of the larger educational framework and as the primary consumer of state-provided knowledge. Our model aims to reframe the traditional perspective on students' roles in education. By introducing the "Dual Lex" concept, this study aims to merge (melt) two principal different educational models into a cohesive whole. The term "Dual" emphasizes the simultaneous use of these two methodologies, while "Lex" suggests a set of principles or rules governing this integration. Overall, this approach seeks to establish an educational framework that is as methodical and precise as it is creative and expressive, thereby equipping students with the skills and knowledge for a versatile and dynamic educational journey and more flexible and student-centered preparation for their future professional careers.

## KEYWORDS

logistics, PUSH, PULL, education, educational processes

## 1 Introduction

Within the realm of education, the analysis of the PUSH and PULL approaches unveils captivating dynamics of knowledge dissemination and acquisition. The PUSH and PULL concepts have their roots in supply chain and logistics management, where they describe strategies for managing product flow and demand. The use of these methods to interpret the educational process is more profound when viewed through various fields of science and art. Thus, the prisms of physics, chemistry, music, and simply allegories were used from the angle of refraction of logistics. Education has an important social responsibility beyond what is usually expressed in the dyad of teaching and learning

(Fernando, 2023). Apart from the traditional educational purpose of imparting knowledge and developing skills, academic institutions should strive to meet the needs of the students, the families, and the larger community they serve. While forming and informing new generations, educational systems also need to care for individuals' physical, social, and emotional wellbeing (Fernando, 2023). Reflections inspired by logistic principles elucidate this process, parallel to how goods traverse supply chains utilizing PUSH (curriculum-oriented) or PULL (student-driven) mechanisms. Over time, these concepts have been adapted to educational methodologies to depict contrasting approaches to delivering and acquiring knowledge. Like well-coordinated steps in a dance, these methodologies foster a harmonious rhythm, molding the path of learning for both learners and facilitators.

This exploration encompasses an examination of how students are positioned within these approaches, shedding light on their role: within this educational framework, sophomores find themselves either being shaped by a well-defined system or actively engaging and customizing their learning journey. The fluid progression within the domain of education is conducted by the intricate fusion of progressive advancements and adaptive prowess, resonant with the interplay of PUSH and PULL mechanisms, echoing the efficiency of a meticulously honed logistical network. The Dual Lex Framework integrates PUSH and PULL methodologies in education. "Dual" emphasizes the simultaneous use of both approaches, while "Lex" refers to the guiding principles for their implementation. This framework acknowledges the benefits of both teacher-led instruction (PUSH) and student-driven learning (PULL), aiming to create a balanced and adaptable educational system that caters to diverse learning needs. It's a model that acknowledges the necessity of a guided educational structure and the importance of fostering individual creativity and critical thinking skills. In practice, the Dual Lex model would manifest in academic settings where core knowledge and skills are imparted through a structured curriculum, while also providing opportunities for students to explore subjects of personal interest and engage in creative problem-solving activities. Appreciating the intricate synergy of both in education, akin to the delicate balance observed in scientific phenomena, is fundamental for the refinement of the learning process.

A pivotal aspect of these logistics-inspired approaches is the role they ascribe to students and their financial underpinnings. In the spirit of this exploration, two contrasting educational paradigms were taken—China and Finland, to exemplify the PUSH and PULL models, respectively, and the UK blended both into a hybrid model. China, Finland, and the UK were chosen for their emblematic educational models, with China representing a centralized, PUSH approach, and Finland showcasing a student-centered, PULL system. This selection allows for a broad analysis of how different systems implement and balance structured and flexible learning strategies, providing insights into diverse educational outcomes. Furthermore, the UK's hybrid educational model, blending aspects of both paradigms, will be thoroughly examined for its unique amalgamation.

According to a range of literary perspectives (drawing from key insights in the following resources (Sahlberg, 2015; OECD,

2016; Roberts, 2017; Walker, 2017; Li and Jian, 2019), the present situation of the education system in different countries can be understood as follows. In China, the PUSH approach embodies a highly structured and competitive system, akin to a meticulously planned supply chain. In The Celestial Empire, education is synonymous with rigor, exemplifying a true PUSH approach. The national curriculum standards, established by the Ministry of Education, provide a clear roadmap of what and when students should learn. For instance, the Chinese National Program for Compulsory Education delineates subject content and proficiency expectations for each academic year. Students are seen as valuable resources or materials, reflecting raw materials in a production process. It focuses on molding and shaping them to meet predefined academic goals set by educational institutions and governing bodies. The education system is primarily funded by the national government, changing education as a service provided to the nation in China. This model as many others aligns with a PUSH approach, resembling a logistical system where goods are propelled forward according to a predetermined space. Contrary to the PUSH approach in The Celestial Empire, Finland's education system is a perfect embodiment of PULL. The emphasis here is on student-centered learning, holistic development, and minimal standardized testing. Finnish students are regarded as active participants or customers in their education, ordering knowledge that aligns with their unique needs and aspirations. Education is publicly funded and viewed as a personal service to the students. This model echoes a PULL approach, comparable to a demand-driven supply chain, where goods (knowledge, in this case) are PULL, that are based on consumer needs and preferences.

As we traverse across contrasting educational philosophies in China and Finland, the United Kingdom (UK) emerges as an intriguing bridge, seamlessly amalgamating the structured PUSH approach with the flexible PULL approach. This hybrid education model exemplifies a nuanced balance between structure and adaptability, catering to the diverse needs of students while adhering to standardized educational benchmarks. Further, the PUSH components of the UK's education system are exemplified by a delineated curriculum, guided by the National Curriculum,<sup>1</sup> and reinforced by standardized assessments such as SATs (Standard Assessment Tests)<sup>2</sup> and GCSEs (General Certificate of Secondary Education).<sup>3</sup> These standardized elements offer a structured framework, providing predefined learning objectives and ensuring uniformity in education across the nation. This structured approach is analogous to a logistical plan, establishing a predetermined educational trajectory. Conversely, the PULL facets of the UK's education system prioritize personalized learning and critical thinking. There is a burgeoning emphasis on individualized approaches, encouraging students to actively

1 A set of standards and subjects taught in primary and secondary schools in England, designed to ensure consistent education across schools. It defines what subjects are taught and the knowledge and skills students should achieve at various stages.

2 Standardized exams in England are taken by primary school students at the end of Key Stages 1 and 2 (ages 7 and 11).

3 Academic qualifications in specific subjects, usually taken by students aged 14-16 in England, Wales, and Northern Ireland.

engage in their learning process and allowing for a variety of teaching methodologies. Students are prompted to think critically, participate actively, and cultivate a profound understanding of the subject matter, analogous to a PULL strategy that captivates them within the educational experience. This hybrid model acknowledges the necessity of standardized benchmarks while also recognizing the importance of catering to individual learning styles and nurturing creativity. The UK's education system, by integrating the structured aspects of a PUSH approach with the adaptability and engagement of a PULL approach, seeks to offer a comprehensive and responsive educational experience, preparing students for the exigencies of a rapidly evolving world.

These contrasting roles assigned to students and the financial dynamics showcase the fundamental differences between the PUSH and PULL approaches in education. Understanding these differences helps unravel the benefits and disadvantages associated with each approach. Navigating this exploration, the aim is to shed light on how these two distinct logistic-inspired paradigms shape the educational landscape, influencing the journey of students and the outcomes of the educational system. By doing so, we strive to illustrate how the choreography of PULL and PUSH orchestrates an educational symphony, enabling a harmonious and responsive journey through the realms of different fields of study and art.

The article is organized as follows. The introduction outlines the adaptation of PUSH and PULL strategies from logistics to education, comparing their implementation in China's structured system, Finland's learner-centric approach, and the UK's hybrid model, setting the stage for a deeper discussion on their impact in the following sections. The chapter "Understanding PUSH and PULL approaches" discusses the PUSH and PULL methods in education of three different countries, employing metaphors from science and art to deepen the understanding of these strategies. It utilizes both literal and metaphorical interpretations to enrich the comprehension of these contrasting systems. In the "Addressing the Challenges Through Syncing Steps" section, the paper discusses synchronizing PUSH and PULL strategies to enhance education. It proposes integrating these methods to create tailored learning experiences, leveraging technology for accessibility, and offering a curriculum that combines structure with flexibility. The goal is to create a cohesive system that caters to diverse learning styles, maximizes engagement, and fosters lifelong learning. The conclusion emphasizes the "Dual Lex" as a harmonious blend of PUSH and PULL educational methods, advocating for an educational system that values both structure and student agency.

It suggests that such an integrated approach can lead to a more dynamic and personalized educational experience, preparing students for lifelong learning and success.

## 2 Understanding PUSH and PULL approaches

As far as is known - PULL and PUSH are parts of logistics, which are used for restraining the material and services flow from producers to consumers (Hinkelman and Putzi, 2005). These approaches can be implemented in education processes for describing information flow and knowledge from teachers to

students. In this section, PUSH and PULL methods are interpreted, based on the literature I have reviewed, although it represents my unique perspective on these methods.

The PUSH model is marked by centrally defined and standardized principles of instruction, where the curriculum is determined ahead of time and pupils are urged ahead at an anticipated speed. This model can be likened to a structured conduit of knowledge and instructions delivered from the educational system to the learners. It may be required in foundational classes where students need elementary knowledge to proceed with their further studying. They're valuable in scenarios where ongoing consistency is required (e.g., for standardized tests and certification programs). The impetus to learn and progress is primarily external, instigated by predefined syllabi, standardized assessments, and teacher-led directions (Rodriguez and Fitzpatrick, 2014; Tomlinson, 2014; Zhao, 2018; Ilomäki et al., 2023; Wibowo et al., 2023).

*Metaphor:* Imagine a bustling marketplace where learners are like customers. They navigate the market stalls (resources), selecting and purchasing what aligns with their needs and preferences (learning goals).

Incompatible with PUSH - PULL is a bottom-up, anarchic education system where students are self-driven learners (autonomous knowledge seekers) in charge of their curriculum and pace of progress. In this role, teachers become facilitators and coaches, supporting students to identify their passions, grow their strengths, and expand their knowledge. PULL principles are used in situations requiring deep learning, high cognitive activities, and efficient problem-solving. These principles allow students to internalize ownership over the learning path they are on and choose their own goals and tasks. They facilitate the development of hands-on skills and foster teamwork and collaborative behaviors (Rodriguez and Fitzpatrick, 2014; Tomlinson, 2014; Zhao, 2018; Wibowo et al., 2023).

*Metaphor:* Imagine a bustling marketplace where learners are like customers. They navigate the market stalls (resources), selecting and purchasing what aligns with their needs and preferences (learning goals).

The hybrid model in education can be likened to a blended landscape, harmoniously integrating elements of both PUSH and PULL dynamics. The idea is to consider national standards as well as student needs and interests. The PUSH part consists of a certain number of qualifications that any student should obtain which are also included in a standardized part of the curriculum. At the same time, students can choose any subject from a defined list of subjects or courses where they would like to study in several areas that interest them. It's a flexible and adaptive approach where educators provide essential guidance and structure (PUSH), while also encouraging students to explore and tailor their learning experiences (PULL). This model promotes a balanced interplay between external guidance and internal motivation (Tomlinson, 2014; Sahlberg, 2021; Wibowo et al., 2023).

*Metaphor:* Consider a guided nature hike (representing the PUSH aspect) with a knowledgeable guide providing directions and insights. Anyhow, within this organized journey, hikers have the freedom to explore side trails and points of interest (representing the PULL aspect) based on their preferences and curiosity.

To delve deeper into the understanding of these approaches, we intend to elucidate the fundamental principles underlying the educational process within the context of each respective model. By exploring educational areas and their principles from the most prominent representatives (China, Finland, and the United Kingdom), it is possible to provide a comprehensive overview of how PUSH and PULL approaches manifest themselves in various aspects of enlightenment, highlighting their influence and implications for the educational process and learning outcomes.

## 2.1 Use of PULL, PUSH, and hybrid strategy

Terry P. Harrison summarized when to use each one of the three supply chain strategies (Terry P. Harrison and Neale, 2003):

A PUSH-based supply chain strategy is usually suggested for products with low demand uncertainty, as the forecast will provide a good indication of what to produce and keep in inventory, and also for products with high importance in reducing costs.

A PULL-based supply chain strategy is usually suggested for products with high demand uncertainty and with low importance, which means, aggregation does not reduce cost, and hence, the firm would be willing to manage the supply chain based on realized demand.

A hybrid strategy is usually suggested for products in which uncertainty in demand is high, while is important in reducing production and delivery costs. An example of this strategy is the furniture industry, where production strategy has to follow a pull-based strategy since it is impossible to make production decisions based on long-term forecasts. However, the distribution strategy needs to take advantage of economies of scale to reduce transportation costs, using a push-based strategy.

Educational systems around the world can learn a lot from supply chain strategies. Just like a well-planned supply chain, a well-curated curriculum can create a smooth and effective learning experience. For subjects that always have a high demand, like the core academic courses, a push-based approach is a great fit. This is just like making sure a popular product is always in stock. On the other hand, for specialized electives or workshops where student interest can vary, a pull-based approach is ideal. This is like custom-making a product based on customer requests. Then there are situations where a blend of both strategies works best, much like a hybrid supply chain strategy. This flexible approach allows educational systems to provide a structured learning foundation while also catering to the evolving interests and needs of students, striking the perfect balance.

In the UK, the approach to education can be likened to a glissade (smooth continuous transition) between PUSH and PULL strategies. For core subjects such as English and Math, where demand is fairly predictable, a push strategy takes the lead. Schools anticipate the number of students and proactively prepare by creating teaching materials, hiring teachers, and allocating resources based on these estimations (Department for Education, 2019). Nevertheless, for elective courses or specialized vocational training, where student interest can fluctuate, a pull strategy takes the stage. Schools stay nimble, waiting to see what students are interested in before customizing their offerings and

allocating resources. In some areas, a duet of these strategies is performed. This approach aligns with the UK's National Curriculum, which sets standardized learning objectives for these core subjects (Oates, 2011). This is particularly true for distributing educational resources like textbooks or digital learning platforms. Here, educational publishers may strike a balance, producing a certain number of textbooks based on forecasts (PUSH), while also remaining flexible to print on demand or distribute digital copies based on actual demand (PULL).

As for Finland, a country celebrated for its innovative and comprehensive education approach, strategies vary based on the nature of the curriculum. For fundamental aspects that remain consistent over time, such as core competencies in science and technology, they lean toward a push-based strategy. This involves education authorities utilizing forecasts and long-term planning to craft teaching materials and assign resources. However, when it comes to Finland's student-focused education system, where the emphasis lies on personalized learning and student autonomy, a pull-based strategy is more fitting. In areas such as project-based learning or student-led extracurricular activities, schools mold their offerings based on students' interests and needs, rather than sticking to a predetermined curriculum.

The national core curriculum, which outlines fundamental aspects such as core competencies in science and technology, is developed through a collaborative process involving various stakeholders, including education authorities, teachers, and even students (Vitikka et al., 2012; Finnish National Agency for Education, 2016). There are also situations where blending both strategies is the most beneficial approach. For instance, in the case of implementing digital learning platforms or educational technologies, a hybrid push-pull strategy can be effective. Here, the initial investment in infrastructure and content creation necessitates a push-based approach. However, as these platforms evolve, they need to adapt and customize based on user feedback, calling for a pull-based approach. This back-and-forth creates a kind of educational harmony (Niemi et al., 2016). There is a national vision of keeping everyone on the same page, but with enough wiggle room for each school to add its local flavor. It's like a national recipe that each community can spice up to suit its taste.

In the vastly diverse educational landscape of China, different strategies are employed to meet various needs. For instance, a push-based strategy comes into play for standardized testing and exam preparation materials. Given the uniform demand across regions, educational authorities use forecasts and centralized planning to create and distribute study resources to schools. However, as the educational landscape evolves, particularly in specialized fields like technology or innovation, a pull-based strategy becomes more relevant. Institutions can adjust their programs and resources to match the changing needs of the industries and employers, modifying their curriculum and training programs as needed. In some cases, a hybrid push-pull strategy is the most beneficial. This is particularly true for initiatives aimed at promoting educational equity whilst optimizing resource allocation. For example, in providing educational infrastructure and facilities to underserved areas, an initial push-based approach is required to make the necessary investments. But as these areas develop, adjustments based on local needs and preferences necessitate a shift to

a pull-based strategy (Liu et al., 2016; Huang et al., 2020; Wang, 2020).

In all these scenarios, it's essential for those shaping our education systems – policymakers, and institutions – to grasp the unpredictable nature of demand, and the role economies of scale play. These insights empower them to make informed, thoughtful decisions on everything from designing curriculums and allocating resources to planning educational strategies.

## 2.2 Development and implementation of educational programs

The consequence of the development and implementation of educational programs lies in their ability to shape the learning experience, effectively transmit knowledge and skills, and foster critical thinking and personal growth among learners. Well-designed educational programs consider the needs of students, societal requirements, enhancements in various fields, and the educational context to ensure that the learning process is effective and meaningful. The dissection of the development and implementation of educational programs, examining their alignment with the principles of PUSH, PULL, and Hybrid approaches (“Guidance”, “Choice”, and “Dual Focus”). This offers insights into the adaptive interplay of structure and freedom in education.

### 2.2.1 “Guidance”

China is often viewed as the predominant proponent of the PUSH approach, where study programs are clearly defined and structured. National standards dictate the subject content and the proficiency tiers for the respective grade level of each academic year, an example—the Chinese National Program for Compulsory Education (the mandatory implementation of education within the actual jurisdiction of the People’s Republic of China). Gaokao, which significantly influences a student’s academic trajectory, is also a part of this National Program (OECD, 2016). It establishes national curriculum standards that outline the key subjects, content, and learning objectives for various stages of education. What is more, it regulates the education system at the national level, overseeing policies, standards, and reforms (setting goals and strategies for the sector’s growth). Furthermore, significant emphasis on Science, Technology, Engineering, and Mathematics (STEM) education to foster innovation, research, and development in line with China’s modernization goals (OECD, 2016). It is crucial to impart accurate education within specific educational systems and disciplines, enabling students to develop practical skills. The structured, standardized, and strategically directed nature of the PUSH approach in China unveils a philosophical underpinning—an ideology woven into the fabric of education (Tzu, 2010). Much like logistics, where the PUSH strategy involves the proactive distribution of resources along a predetermined route, this educational model aligns with efficiency and order. It reflects a logistical philosophy where resources (knowledge, skills) are systematically moved forward to reach predetermined educational milestones, mirroring the optimized

movement of goods in supply chains. This approach resonates with the ancient philosophies of order, mirroring the Confucian principles of hierarchy and collective advancement. In both logistics and education, a structured foundation is seen as crucial to achieving the grand tapestry of societal growth and individual prosperity (Tzu, 2010).

### 2.2.2 “Choice”

The evolution of educational strategies from PUSH to PULL approaches reflects a deeper understanding of learning processes and the increasing diversity of student backgrounds. This shift can be justified through various pedagogical perspectives, particularly the constructivist approach to learning. Constructivism posits that learners actively construct knowledge based on their experiences and interactions with the environment. This aligns closely with the PULL strategy, which acknowledges and accommodates the different starting points of students. In a constructivist framework, learning is not a one-size-fits-all process, but rather a highly individualized journey. Historically, the PUSH approach may have been more effective when student populations were relatively homogeneous. In such contexts, a standardized curriculum and teaching method could reasonably address the needs of most learners. However, the development of the information society has led to increasingly diverse student backgrounds, encompassing varied experiences, knowledge bases, and learning styles. This diversification of student populations necessitated a shift in pedagogical approaches. The PULL strategy emerged as a response to this new educational landscape, offering a more individualized direction in pedagogy. It recognizes that students come to the learning environment with different prior knowledge, skills, and experiences, and allows them to “pull” information and experiences relevant to their unique needs and aspirations.

A conspicuous case of using PULL approach, which particularly focuses on student agency and choices, is Finland (Li and Jian, 2019). In Finland, the PULL approach entails a more flexible approach to study programs. Programs are tailored to students’ needs, allowing them to choose courses and levels of difficulty. The student’s active involvement in making choices for their course helps create a sense of ownership and motivation. Additionally, in Finland, the focus is on overall development rather than on standardized tests (Rodriguez and Fitzpatrick, 2014).

The evolution of educational strategies, particularly the shift from PUSH to PULL approaches, represents a significant paradigm shift in modern pedagogy. This transformation is exemplified by Finland’s education system, which has successfully balanced individualized learning with the achievement of general educational goals. At the core of Finland’s approach is a move away from high-stakes, examination-based education toward a more holistic model of pupil development. This model prioritizes critical thinking, problem-solving skills, creativity, and cooperation - competencies crucial for success in the 21st century. By emphasizing these skills, Finland’s education system prepares students not just for tests, but for the complexities of the real world. Central to this approach is the integration of active, hands-on experiences into the curriculum. Learning becomes more meaningful and effective when students can apply theoretical

knowledge in practical settings. This is achieved through a variety of means, including internships, apprenticeships, and project-based learning experiences. Such practical applications serve a dual purpose: they deepen understanding of academic concepts and prepare students for the demands of a rapidly changing global job market.

Importantly, Finland's education system is not static. It adheres to the principle of continuous improvement, as noted by Pasi (2021) and Ilomaki (2023). Regular feedback from teachers, students, and stakeholders allows for periodic evaluation and adjustment of study programs. This iterative process ensures that education remains relevant, effective, and adaptable to society's evolving needs. The Finnish model demonstrates how PULL strategies can be effectively employed within a framework that maintains high national standards and prepares students for global competitiveness. It allows for individual learning paths while ensuring all students develop critical skills and knowledge essential for societal progress. This balance is crucial: it shows how education systems can harmonize individualized learning approaches with the achievement of general educational goals. The PULL strategy aligns well with our understanding of cognitive processes and brain function. The brain's capacity for neuroplasticity - its ability to reorganize and form new neural connections - is optimized by personalized learning approaches. By allowing for targeted 'neural stimulation' based on individual differences and current knowledge states, the PULL approach enhances the efficiency and effectiveness of the learning process. In essence, Finland's adoption of a PULL approach, centered on a student-centric model (SCM), allows learners to engage with knowledge and experiences relevant to their diverse demands and aspirations. This approach not only encourages flexibility and critical thinking but also fosters a lifelong love for learning. The shift toward PULL strategies in education, as exemplified by Finland, is not merely a trend but a necessary evolution in pedagogy. It reflects our growing understanding of how learning occurs, acknowledges the increasing diversity of student backgrounds, and adapts to the needs of an information-rich society. By viewing education through the lens of learning itself, we can appreciate that the PULL strategy offers a more nuanced, flexible, and ultimately more effective approach to education in our modern, diverse world.

This evolution in educational strategy presents both opportunities and challenges. The key lies in creating flexible systems that can adapt to individual needs while ensuring all students acquire the necessary skills and knowledge for personal success and societal contribution. As we move forward, the Finnish model provides valuable insights into how education can be reimagined to meet the complex demands of our rapidly changing world.

### 2.2.3 "Dual focus"

Within the hybrid model, educational programs are designed to strike a dual focus: providing essential guidance and structure analogous to the PUSH approach, while also encouraging students to actively explore and tailor their learning experiences/choices, much like the PULL approach. The curriculum is thoughtfully

crafted, incorporating both national standards and options for personalized learning (Raes et al., 2020; Teräs, 2022).

- *Structured framework vs. flexibility*

Like a well-coordinated dance, the structured elements of the hybrid model offer a predetermined framework, defining essential learning objectives and ensuring uniformity in education. This structured aspect resembles a logistics plan, establishing a predefined educational path.

- *Personalized learning vs. critical thinking*

On the other hand, the hybrid model also prioritizes personalized learning and critical thinking, encouraging students to actively engage in the learning process. It emphasizes individualized approaches, enabling students to think critically, participate actively, and develop a profound understanding of the subject matter.

- *Adaptability vs. engagement*

The model encourages adaptability and engagement, allowing students to explore different teaching methodologies and learning styles. This adaptability is vital to cater to diverse learning needs, ensuring that every student finds a path that resonates with their abilities and aspirations.

The hybrid model in education can be likened to a blend of logistics principles, where structured planning meets adaptive responsiveness. Logistics, in its essence, is about efficient planning, resource allocation, and responsiveness to changing conditions. Similarly, the hybrid approach integrates the structured aspects of a PUSH approach, emphasizing planned logistics, with the adaptability and engagement reminiscent of a PULL approach. The harmony created through this balance fosters an enriched learning experience (Tzu, 2010; Raes et al., 2020).

With this in mind, the hybrid model stands as an epitome of equilibrium, blending structured guidance with adaptive exploration. It offers a comprehensive educational journey that prepares students to navigate the evolving landscape of knowledge and growth (Garrison and Kanuka, 2004). This approach not only cultivates a structured learning environment but also instills in students the ability to think critically, adapt swiftly, and contribute meaningfully to an ever-changing world (Dziuban et al., 2018). The hybrid model's effectiveness is supported by research showing improved learning outcomes and increased student engagement (López-Pérez et al., 2011). It addresses the limitations of traditional models by incorporating flexibility and personalization, key factors in modern education (Horn and Staker, 2014).

## 2.3 Educational technologies and resources

In the evolving landscape of education, integrating educational technologies and digital resources is paramount to enhancing learning experiences and outcomes. This part of the article delves into the integration of these tools within the PUSH, PULL, and Hybrid models ("Crescendo", "Sonata", and "Cadence"), evaluating their impact on accessibility, engagement, and learning outcomes

across China, Finland, and the UK. The intention to infuse a sense of musicality and rhythm into this chapter title—metaphorically represents the integration of technology and its impact on education, drawing a parallel to the harmony and structure found in music. Each title seeks to evoke a unique musical experience while maintaining a connection to the educational themes.

### 2.3.1 “Technological crescendo in pedagogy”

In the context of technology, “crescendo” implies a steady rise or enhancement in the use and influence of technology in education, capturing the essence of progress and amplification. It aptly represents the PUSH approach in China due to its gradual and deliberate increase in technological integration. The expression reflects the structured and escalating infusion of technology, mirroring the proactive approach of the Chinese education system in orchestrating a strategic and systemic rise in the use of educational technology to optimize learning outcomes.

In China, the integration of technology in education follows a crescendo-like trajectory. Initiatives such as smart classrooms, AI-powered tutoring systems, and immersive learning technologies orchestrate a gradual rise in the intensity and depth of technological implementation. This “crescendo” embodies a strategic and systematic infusion of technology, aiming to amplify educational outcomes. For example, AI-driven adaptive learning platforms tailor learning experiences, gradually enhancing their effectiveness (Huang et al., 2021; U.S. Department of Education, 2023).

### 2.3.2 “Harmonizing knowledge: a digital sonata”

“Sonata” often conveys a sense of structure and varied movements, that represent the PULL approach. This aligns with the diverse ways technology harmonizes with Finland’s education. “Harmonizing” emphasizes the blending and integration of technology and knowledge. Just as a sonata is a unique composition, tailored to the musician’s expression, the PULL system in Finland tailors education to each learner. The personalized use of technology allows students to “pull” educational resources based on their individual needs and preferences, analogous to how a musician creates a distinct musical composition.

The focus is on personalized learning supported by a symphony of digital tools. Adaptive learning apps, interactive online resources, and digital portfolios compose the notes of this sonata. Each learner’s melody is created through a harmonious blend of technology, allowing them to explore their unique educational paths and tempos (Lavonen, 2020).

### 2.3.3 “Cadence of e-education”

A cadence embodies the harmony of structure and flexibility. In the UK’s hybrid model, the term cadence symbolizes the balanced interplay between the structured (crescendo) and personalized (sonata) aspects of education. It reflects the rhythmic synchronization of these elements, forming a unique educational “tune” that adapts to the diverse needs of students. EdTech applications, virtual labs, and AI-driven assessment tools

harmonize with the educational orchestra. It’s a deliberate rhythm, synchronizing the benefits of both approaches.

By infusing technology with the finesse of a musical composition, these countries are creating a symphony of educational innovation (Teräs, 2022). The crescendo in China amplifies the impact of technology, the sonata in Finland individualizes learning, and the cadence in the UK harmonizes structure and flexibility, thus orchestrating a melodious future for education (Teräs, 2022).

## 2.4 Teacher training and professional development

Embarking on an exploration affiliated with unraveling the intricacies of physics, we delve into the realm of education, specifically focusing on the vital domain of teacher training and professional development. Much like the laws governing motion and forces in physics, the world of education adheres to principles that guide its approaches and strategies. In our quest to comprehend these approaches, we shall adopt the lens of physics and metaphorically draw parallels between the dynamic field and the methodologies employed in three distinct educational landscapes: China, Finland, and the United Kingdom. We shall examine how each nation crafts its own “educational laws”, whether adhering to precise, structured “Precision Dynamics” (PUSH), embracing an adaptive, student-centric “Adaptive Kinetics” (PULL), or orchestrating a harmonious blend of both in “Harmonized Resonance” (Hybrid). Through this scientific exploration, we aim to shed light on the varied strategies employed in training and developing educators, furthering our understanding of the global educational landscape.

### 2.4.1 “Precision dynamics”: crafting a pedagogical blueprint

In China, the educational landscape adopts a “Precision Dynamics” kindred to the principles governing precise motion in physics. Teacher training and professional development are meticulously aligned with prescribed curricula and standards, resembling the predictable paths of particles in motion. Educators are systematically trained to adhere to these set principles, focusing on transmitting established knowledge and achieving standardized outcomes (Guo et al., 2019). “Precision Dynamics”, reflecting the meticulous planning and structured flow in logistics from the PUSH point of view, signifies a well-defined pedagogical framework with digital technologies used (Mertala, 2019). In this approach, teacher training programs are designed with a clear roadmap allied to a supply chain plan. The training is meticulously structured, following a preset blueprint, like logistics, and adheres to defined routes and schedules for optimal efficiency.

### 2.4.2 “Adaptive kinetics”: nurturing flexibility and student-centricity

In Finland, the “Adaptive Kinetics” model parallels the principles of adaptation and flexibility observed in the physics of

dynamic systems. Teacher training and professional development revolve around recognizing the diverse needs and abilities of students, similar to particles with varying principles. Teachers are prepared to adapt and tailor their teaching methods according to each student's unique learning path, fostering a student-centric approach. The focus shifts from rigid curricular adherence to nurturing educators who are agile, responsive, and capable of customizing learning experiences (Lavonen, 2018).

It mirrors the dynamism of a PULL approach from a logistics perspective. Training programs are flexible, allowing teachers to “pull” relevant knowledge and skills based on their specific requirements and the unique dynamics of their groups. This adaptability mimics a flexible supply chain that responds to varying demands, nurturing a student-centric and dynamic teaching experience.

### 2.4.3 “Harmonized Resonance”: orchestrating structure and flexibility

In the United Kingdom, the “Harmonized Resonance” approach is a blend of both precision and adaptability, echoing the wave-particle duality in physics. Teacher training and professional development strike a delicate balance between structured guidance and adaptability, akin to the harmony of waves and particles in physics. Teachers are equipped with a foundational knowledge base, comparable to the structured wave, while also encouraged to resonate with the unique learning frequencies of each student. The approach integrates the advantages of both PUSH and PULL strategies, aiming for an orchestrated educational experience (Timperley et al., 2007; Lavonen, 2018). It embodies the balanced amalgamation of structure and adaptability in the hybrid approach, similar to supply chain optimization. In this approach, teacher training harmonizes structured elements (analogous to logistics planning) with adaptable components (like flexible supply chains). Also, the following studies highlight the effectiveness of expert teaching alongside peer learning. Diverse absorption rates among students can be balanced by pairing them for collaborative study, guided by the teacher, to foster collective understanding (Davidesco et al., 2023).

The programs maintain a structured core curriculum, ensuring consistency and alignment with educational standards, while also allowing for customization based on individual teaching styles and evolving educational trends. This dual nature resonates with the need for a balanced and efficient teacher training and development system.

These analyses highlight how each country's approach to teacher training and professional development aligns with the principles of physics, elucidating the educational ‘motion’ and dynamics within their respective systems.

## 2.5 Socioeconomic factors and equality

In the realm of education, just as environmental sustainability hinges on equilibrium and efficiency, educational approaches across different nations bear unique parallels to principles found in the realm of Environmental Sustainability. China, Finland,

and the UK embody distinct approaches, resembling aspects of industrial symbiosis, ecosystem sustainability, and dynamic equilibrium, respectively. These approaches, deeply influenced by socioeconomic factors, reflect a sophisticated interplay of structure, adaptability, and societal harmonization. This exploration delves into how these approaches mirror environmental sustainability concepts and how socioeconomic elements intertwine, providing a profound insight into education's role in fostering equilibrium and progress.

### 2.5.1 “Industrial harmony for progress”

China's approach to education reflects the concept of industrial symbiosis in environmental sustainability. In industrial symbiosis, industries collaborate to share resources and reduce waste. Similarly, China's education system emphasizes collective progress and societal harmony. The centralized education system helps in efficient resource allocation, resembling the collaboration in industrial symbiosis (Timperley et al., 2007). Socioeconomic imbalances in China's approach (Yang, 2004; Morgan, 2011; Guo et al., 2019):

- *Urban-rural divide*  
China faces a significant urban-rural divide in terms of educational resources and opportunities. Urban areas tend to have more advanced educational facilities and opportunities compared to rural areas, affecting the equality of educational access.
- *Hukou system impact*  
China's Hukou system, a household registration system, affects where individuals can access education. Those registered in urban areas typically have better access to educational resources than those registered in rural areas.
- *Economic disparities*  
Economic disparities between regions and social classes can impact the quality of education available. Affluent regions often have better-funded schools and resources, contributing to disparities in education quality.

These key aspects act as pressure points on the educational engine, warranting ongoing adjustments to maintain harmony. Notwithstanding, it can also lead to a lack of individualization, analogous to how industrial symbiosis might overlook individual sustainability. Just as industrial symbiosis optimizes resource utilization and waste reduction in various industries, China's centralized approach optimizes educational resource distribution efficiently, connate to a centralized logistics hub.

### 2.5.2 “Ecosystemic equilibrium in education”

Finland's education approach mirrors ecosystem sustainability. Ecosystems are diverse, dynamic, and interconnected, promoting balance and adaptation. Finland's approach is influenced by its relatively homogeneous society, valuing education to promote social equality and innovation. A society with less income disparity ensures that educational opportunities are available to all socioeconomic groups. Similarly, Finland's education system values diversity, adaptability, and the interconnectedness of learners.



The focus on individualized learning and flexibility resembles the resilience and adaptability seen in sustainable ecosystems. Socioeconomic key points in Finland's approach (Simola, 2015):

- *Teacher professionalism and status*  
Finland's approach values teachers highly, attracting top talent to the profession. This societal respect for educators contributes to the success of the education system and attracts talented individuals to the teaching profession.
- *Comprehensive social support system*  
Finland's robust social support systems, including healthcare and social services, create a conducive environment for learning. Children are more likely to succeed in education when their wellbeing is taken care of.

Yet, just as ecosystems face threats, Finland's system grapples with the challenges of maintaining equality and adapting to the changing socio-educational landscape. Like an ecosystem's resilience and adaptability, Finland's education system exhibits flexibility and adaptability to cater to individual needs, resembling the "just-in-time" principle in logistics.

### 2.5.3 "Dynamic equilibrium for progress and equality"

The UK's hybrid approach aligns with the principle of dynamic equilibrium in environmental sustainability. Dynamic equilibrium is a state of constant change and adaptation within a system. The UK's education system similarly seeks a balance between a structured curriculum (PUSH) and individual choice (PULL), adapting to societal needs. Socioeconomic imbalances in the UK's approach (Leathwood and Hayton, 2002):

- *Income disparities*  
Socioeconomic inequalities in the UK, notably related to income, can influence the quality of education accessible to students. Lower-income families might face challenges in accessing high-quality education.
- *Regional disparities*  
Disparities in educational resources and opportunities exist between different regions within the UK. Urban centers often have more educational resources compared to rural areas, impacting the quality of education.
- *Educational policies and funding*  
Government policies and funding allocation directly impact educational access and quality. Policies that address socioeconomic disparities and ensure fair funding can promote a more equitable education system.

Be that as it may, this dynamic equilibrium can be challenging to maintain due to socio-economic disparities, agnate to how environmental equilibrium is impacted by various factors like climate change and human activities. Just as a dynamic equilibrium in logistics involves adapting to changing demand while managing inventory effectively, the UK's approach dynamically balances structured curriculum (inventory) and personalized learning (demand), adapting to societal shifts. This alignment highlights the socioeconomic and logistical underpinnings of each approach,

shedding light on how they manage resources, adapt to change, and strive for equality in their unique contexts.

## 2.6 Dynamics and interaction in the classroom

With regards to education, the classroom is characterized by an almost dancelike composition of molecular dynamics which determine the kind of learning or even the quality of a particular class. As we gaze into this mini-universe through the eyes of Chemistry (Covalent bonds, Vibrational Dynamics, and The Brownian Motion), the correlation between chemical motions and education is illuminated. Here our focus is on how the inner workings of classroom structure in China, Finland, and the UK determine such interactive forces. In the same manner, the covalent and ionic bonds dictate the behavior of Molecules and similarly, the PUSH and PULL models determine the landscape of education in these countries.

### 2.6.1 "The covalent momentum"

With a PUSH model acting as covalent bonds in a tightly structured supply chain, the educational system acts as if it were a single molecule in China. These covalent bonds make a strong and orderly system, and the curriculum and education programs fulfill this role. Such an approach stems largely from the Chinese cultural focus on orderliness, respect for elders/authority, and communal happiness. Without such alignment, the PUSH model appears vital to establish a common denominator of standardized education in the country striving to reach defined levels of socioeconomic development. Through the government's participation in curriculum formulation and execution, the school system becomes integrated and homogeneous in education (Chou and Spangler, 2016).

Nevertheless, this structure has some aspects of the PULL strategy. The recognition of the importance of creativity, critical thinking, and adaptability is growing with the advent of technological progress and a global perspective. These include an introduction of more interactive and student-led learning processes - something that represents molecular motion within the covalent structure to take up a hybrid form.

### 2.6.2 "Oscillations between structure and freedom"

In Finland, the educational system is much like a logistics network that exists at an equilibrium, comparable to motion in chemical molecules. This analogy emphasizes the perpetual movement and adaptability within the Finnish educational system. The PULL model applies in respect of the education system in Finland where there is great trust in the teachers, which advocates for flexibility and a student-centered learning approach. It originates from the historical values of Finland promoting equity and social welfare.

Society supports equitable training in equal measure, resulting in mutuality and communal harmony. The PULL characteristics

signify a dynamic equilibrium whereby any changes needed can be made because of one's personal demands or societal occurrences. This molecular motion occurs in the framework of an equilibrium built around collaboration, experiential learning, and critical thinking. This is an indication that it offers a suitable reaction regarding the change of demands in the modern world without compromising stability within the whole system.

### 2.6.3 "Random steps toward educational equilibrium"

The UK's educational approach can be compared to a hybrid logistics model, where structured curriculum (PUSH) and personalized learning (PULL) function as hybrid components, resembling chemical hybridization. It maintains a steady flow of educational substances and directions that are congruent with society's notion of traditional education, knowledge, and excellence. That mirrors the PUSH model; it seeks to keep high education standards and achieve national targets.

Though, the PULL characteristics in the UK's strategy focus on students choosing their path, being flexible, and being sensitive to their learning demands. Molecular motion exists within this hybrid structure as it acknowledges differing learning styles and involves technological adoption into education. This is a method that appreciates individualized education yet holds it within a particular framework. This hybridization reveals a mix of tradition and innovation in the United Kingdom that balances national aspirations with individual students growing up (Grosvenor, 2008; Williams, 2014).

Much as in other spheres such as molecular interactions, education is also a complex affair. It is the alignment of an educational approach as it relates to the cultural social and economic fiber of a country that is central to the success of an approach rather than just the model itself. Similarly, different components such as education, societal environment, and cultural background come together like building blocks to form an educational framework within a country. The exploratory element in this comparison provides support for the idea of education, just like matters of diversity, dynamism, and changes that shape their forms and functions appearance.

## 2.7 Student surveys: feedback in EduLex

One of the fundamental factors of the educational system is feedback. Feedback on assessments can play a crucial role in identifying areas for improvement and guiding students toward more effective study strategies. By carefully observing students' learning outcomes and adjusting instructional methods based on this information, instructors can create a supportive learning environment that fosters meaningful, long-lasting, and transferable learning (Davidesco et al., 2023). It is a mechanism for communicating information about the results or effectiveness of activities, processes, or products. To analyze EduLex itself (a term that conveys concepts related to education, educational systems, principles, rules, or a framework within the realm of learning and academia), it is necessary to resort to a variety of analysis tools -

one of which is a survey. Student surveys have become one of the largest and most frequently used data sources for quality assessment in higher education (Reddy et al., 2018).

Each country will have its approach and view of the questionnaires, based on ideas about their own EduLex (since the principles of each of the states are laid down in the use of one or another approach—PUSH, PULL, or a combined approach - Hybrid).

### 2.7.1 "Academic competition survey"

This title encapsulates the essence of the PUSH approach, which is characterized by a highly competitive academic environment. The term "academic competition" underscores the intensely competitive nature of the education system prevalent in the PUSH approach. Students often face significant pressure to excel academically, striving for the highest ranks and scores in exams. This questionnaire primarily concentrates on academic performance, exam readiness, competition, and the drive to achieve specific academic targets (Siega, 2020). The objective is to gauge the level of academic rigor, competitive nature, and exam-oriented mindset within EduLex, aligning with the principles of a PUSH approach. Survey focus areas (Siega, 2020):

- *Perception of competition understanding*  
How students perceive academic competition, its role in their education, and its influence on their motivation and performance.
- *Stress and pressure*  
Examining the stress levels and pressure experienced by students due to academic competition, including its impact on mental wellbeing and overall academic performance.
- *Preparation and strategies* Investigating the strategies students employ to compete academically, including study habits, time management, and the use of supplementary resources like tutoring and exam preparation.
- *Impact on the learning environment*  
Assessing how the competitive atmosphere influences the classroom environment, student-teacher relationships, and collaboration among peers.
- *Long-term goals and aspirations*  
Exploring how the competitive nature of education influences students' long-term goals, career aspirations, and decisions regarding higher education and future professions. Sample questions:

1. How important do you think exam scores are to your academic success?
2. Do you feel significant pressure to excel academically and rank well in your class?
3. How often do you participate in extra study sessions to improve your test performance?

### 2.7.2 "Student-centric learning survey"

In the context of Finland's education system, which primarily follows the PULL approach, is tailored to comprehensively explore the student-centered learning of education. This survey aims

to gather insights into how this approach influences learning experiences and outcomes in the Finnish educational landscape. The insights from this survey can inform educational policies and practices that emphasize student wellbeing, autonomy, and a more personalized approach to learning. Survey focus areas (Munir et al., 2023; Murphy et al., 2023):

- *Autonomy and decision-making*  
Understanding the extent to which students have the autonomy to make decisions about their learning, choose study paths, and set their educational goals.
- *Collaborative learning*  
Examining the role of collaboration, group work, and peer interaction in the learning process, emphasizes how students learn collectively and share knowledge.
- *Personalized learning experience*  
Investigating the level of customization and personalization in the learning experience, including individualized study plans, and tailored educational support.
- *Teacher-student relationship*  
Assessing the quality and nature of relationships between students and teachers, focusing on mentorship, guidance, and support provided to facilitate a student-centric approach.
- *Intrinsic motivation and wellbeing*  
Exploring how a student-centric learning approach influences students' intrinsic motivation, engagement in learning, and overall wellbeing, both academically and personally. Sample questions:
  1. How much autonomy do you have in choosing your study topics or projects?
  2. Do you feel the education system supports your overall wellbeing and personal growth?
  3. How would you rate the importance of collaborative projects in your learning experience?

### 2.7.3 "Integrated learning survey"

The chosen title represents a critical concept underlying hybridity—integration. It implies merging traditional and contemporary aspects of education. An inherent feature of hybrid is the blending of the structured academic aspects and the flexible and personalized approach to learning. The purpose of this survey is to seek information on how this integrated approach influences the way learners experience and accomplish their desired goals within the UK's educational systems. The insights from this survey can inform educational strategies that promote an effective blend of traditional and innovative methodologies, enhancing the overall learning environment in the UK. Survey focus areas (Grant, 2014):

- *Curriculum integration*  
Understanding how traditional subjects are blended with contemporary, interdisciplinary topics in the curriculum to provide a well-rounded and integrated learning experience.
- *Technological integration*  
Examining the role of technology in the learning process, including how it is seamlessly integrated into educational

activities and how they enhance students' understanding and engagement.

- *Balanced assessment methods*  
Investigating the use of a variety of assessment methods, both traditional and modern, to measure students' understanding, skills, and progress effectively.
- *Student-centered approaches*  
Assessing the implementation of student-centric learning, project-based learning, and collaborative approaches within the integrated educational model.
- *Professional development for educators*  
Exploring how educators are prepared and supported to adapt to this integrated approach, including training and ongoing professional development opportunities. Sample questions:

1. How would you rate the balance between traditional lectures and interactive learning activities?
2. Do you feel you have the flexibility to tailor your coursework to align with your interests and goals?
3. How important is a mix of structured curriculum and personalized projects to your learning experience?

The individual questionnaire for each approach corresponds to the principles and aims of the educational system. In this case, the information obtained through using them helps to understand the perception and the attitude of students toward the educational process in the EduLex context. In the context of PUSH and PULL methods, surveys can be used to analyze individual success and performance aspirations (PUSH) and to assess the level of collaboration and group development (PULL). This allows a better understanding of the educational environment and measures for improvement.

## 3 Addressing the challenges through syncing steps

To harmonize the benefits of the PUSH and PULL educational paradigms, a synchronized approach is imperative.

### 3.1 Propose solutions by synchronizing PUSH and PULL strategies

By merging the strengths of these strategies, it is possible to create a more effective and well-rounded educational system that addresses the diverse needs of students. Here are key solutions that integrate both paradigms (Grant, 2014; Murphy et al., 2023):

- *Tailored educational experiences*  
It will bring customized learning paths for students, allowing them to set goals while ensuring they cover essential subjects. Also, it will provide personalized guidance and support based on individual progress and aspirations.
- *Leverage technology for wider reach*

The flexibility and accessibility of technology should be utilized to enhance the learning experience and extend educational resources to a broader audience. E-learning platforms, interactive apps, and online resources are supposed to be incorporated to provide supplemental learning materials. Ensure that students have access to educational content anytime, anywhere, fostering a more flexible learning environment.

- *Structured yet flexible curriculum*

The structured curriculum is blended, typical of the PUSH approach with the adaptability and choice offered by the PULL approach. Design a curriculum with core subjects and fundamental knowledge (PUSH), allowing students to choose elective courses or specialized tracks (PULL) based on their interests and career goals. It will bring flexibility while maintaining essential academic standards.

### 3.2 Emphasize the need for synchronization

Synchronizing the PUSH and PULL paradigms is not just about finding a middle ground; it's about leveraging their respective strengths to create a cohesive educational system. By drawing on the merits of both approaches, the educational framework that optimizes student engagement and outcomes can be reached. Here's why synchronization is essential:

- *Maximizing engagement*

Synchronization allows to capture students' attention through the structured aspects of the PUSH model while encouraging active participation and interest-driven learning seen in the PULL model.

- *Fostering lifelong learning*

The combined approach instills a love for learning by emphasizing self-motivation (PULL) while providing essential knowledge and skills (PUSH), setting the stage for continuous learning beyond formal education.

- *Adapting to diverse learning styles*

Every student is unique. Synchronization enables us to cater to different learning styles, ensuring that both structured learners (PUSH) and autonomous learners (PULL) thrive in the educational environment.

The synchronization of PUSH and PULL strategies in education is not only about accommodating diverse learning styles but also about creating a comprehensive learning environment that addresses multiple pedagogical principles. This approach is particularly effective in supporting cognitive development and fostering independent learning. One of the key advantages of this synchronized approach is its ability to address Multiple Intelligences, as proposed by Gardner (2011). While structured PUSH activities can cater to linguistic and logical-mathematical bits of intelligence, open-ended PULL tasks allow students to leverage their unique strengths in areas such as spatial, interpersonal, or naturalistic intelligence. This diversity in approach ensures that all students have opportunities to excel and develop across

various domains. Furthermore, the synchronized strategy aligns well with the concept of scaffolding, derived from Vygotsky's Zone of Proximal Development (Vygotsky, 1978). PUSH strategies provide initial structure and guidance, essential for building foundational knowledge and skills. As students progress, PULL strategies allow for increased autonomy, facilitating a smooth transition from dependent to independent learning. This gradual release of responsibility not only builds competence but also fosters self-confidence and intrinsic motivation. The balance of PUSH and PULL strategies also effectively addresses different levels of Bloom's Taxonomy (Anderson et al., 2001). PUSH approaches are particularly suitable for developing lower-order thinking skills such as remembering and understanding, ensuring that students have a solid grasp of fundamental concepts. PULL strategies, on the other hand, naturally lend themselves to higher-order thinking skills including applying, analyzing, evaluating, and creating. This comprehensive coverage of cognitive skills prepares students for complex problem-solving and critical thinking in real-world scenarios. Lastly, this synchronized approach supports the development of metacognition (Flavell, 1979)—the awareness and understanding of one's thought processes. PUSH strategies can explicitly introduce metacognitive techniques, while PULL approaches provide ample opportunities for students to apply and refine these strategies independently. This enhancement of self-regulation skills is crucial for lifelong learning and adaptability in an ever-changing world.

By integrating these pedagogical principles, the synchronized PUSH-PULL approach creates a rich, adaptable learning environment. It not only caters to diverse student needs but also optimizes learning outcomes, preparing students for the complexities of modern life and work.

## 4 Discussion

The term Dual Lex represents the coexistence and integration of two logistical approaches within the education system, emphasizing their significance for effective learning. Just as scientific phenomena find harmony in delicate balances, education thrives on the symbiotic interplay of PUSH and PULL mechanisms. This overview underscores the importance of recognizing and uniting both paradigms within the educational system. The integration of PUSH and PULL educational paradigms holds immense potential to change the educational landscape by harmonizing seemingly opposing approaches. After all, can there be anything common in the approach and educational system of the West and the East? By blending structure with individual empowerment, this integration transcends traditional boundaries, striving for a more unified and effective educational system. Drawing parallels with art, music, and science allows us to visualize this integration more deeply, where PUSH and PULL come together to create a harmonious and enriching experience for the student. Comparisons with existing literature demonstrate the innovative nature of integrating PUSH and PULL educational paradigms. A candid assessment of the educational landscape recognizes the dual role of the student: not merely as a component within a large-scale educational framework, but as a central figure - the primary consumer of the state's educational offerings. This perspective acknowledges the student's

agency and importance in the learning process, viewing them as active participants rather than passive recipients of knowledge. Seems like times are changing, aren't they? While previous views may have focused on the individual approaches of one of the two methods, this discussion highlights the unique contribution of Dual Lex in offering a balanced educational path that takes into account the different learning styles and preferences of both parties. Limitations of integrating PUSH and PULL educational paradigms may include implementation challenges, potential resistance from stakeholders, and the need for further refinement of the "dissolution" process into each other. Addressing these limitations helps us understand the complexities of integrating various educational approaches, similar to the challenges faced by artists, musicians, and scientists as they refine their knowledge and skills to perfection, presenting new ideas. Additional factors that can affect the successful implementation of Dual Lex in the education system must be figured out. The future of education indeed lies in synchronizing the steps of the PUSH and PULL approaches. This integration paves the way for a more effective, personalized, and impactful learning journey. It's about embracing the strengths of both paradigms and channeling them toward a common goal, the holistic development and success of every learner. Let the concept of a blended educational model exist that leverages the strengths of both approaches. It is imperative that we collectively advocate for an educational system that recognizes the uniqueness of each learner. Let students receive the tailored and comprehensive education they deserve. By promoting integration and collaboration, education can be revolutionized and create a brighter future for generations to come.

## Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

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DK: Conceptualization, Investigation, Resources, Supervision, Writing – original draft, Writing – review & editing. JP: Conceptualization, Funding acquisition, Writing – review & editing.

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## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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