

Universal Design for Learning as a Framework for Designing and Implementing Learner-Centered Education

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Abstract

Learner-centered education (LCE) is a paradigm of teaching, learning, and school systems that embraces flexibility and responsiveness to meet the needs of diverse, 21st century students. This paradigm is reflected in a collection of learner-centered principles, including the importance of personalization. Through the lens of creative identity, LCE-aligned practices can be understood to support students' development as creative thinkers who can navigate complex environments reflective of our world. Creative technologies serve as key affordances in transformative learning spaces that empower learners with essential skills and habits of mind. In this article, Universal Design for Learning (UDL) is reviewed as a framework to guide the design and implementation of learner-centered approaches. This framework can be applied by teachers, administrators, and communities when designing innovative learning systems that support the needs and goals of 21st century learners. Finally, this line of thought is brought to life through the example of a school-within-a-school developed in a middle school in the north east region of the United States. This review paper serves as an example of how schools can support students in the development of their creative identities through learner-centered environments designed with the UDL framework.

Keywords: learner-centered education, 21st century learning, learning innovation, Universal Design for Learning (UDL), creative identity, school design

1. Introduction

It was Jalen's (a pseudonym) first day in 6th grade in middle school. In conversation with peers, he knew they felt a mix of nervous excitement about what was to come. For Jalen, however, this nervous excitement was overshadowed by a sense of dread. The pit in his stomach, the tightness in his throat, reflected his past experiences in

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school, struggling to learn how to read and “do school” like his classmates. By the age of 11, he had already decided it was better to shut down and put up emotional walls, rather than to expose his challenges as a student with learning differences and face further frustration. Just barely surviving under this mountain of dread were some crumbs of hope, for something new, something different for Jalen. And this new classroom was different. Jalen was joining a pilot program at his middle school called the Inquiry Lab (IL).

Initially, this school year did not start off much differently for Jalen compared to previous school years. He refused to communicate with teachers or complete work, depicting his low confidence as a learner and lack of positive classroom experiences in the past. This shutdown behavior was especially apparent during reading time, when he quietly refused to even select an independent reading book. After several weeks in the IL, during which the teachers were careful not to push too hard on Jalen’s walls, he began to relax slightly. Then, one day during a writing activity, Jalen’s walls started to come down.

The teachers facilitated a whole group discussion about the purpose of school and how it could be made more meaningful for students. The class watched a motivational YouTube video about the potential of school transformation in the 21st century, geared towards adolescents. After the video ended, the teachers revealed the assignment for the class period. The students would devise a tagline for the Inquiry Lab to represent the aspirations of the program. As students got to work and teachers checked in on their progress, one of the IL teachers noticed something they had not seen before. Jalen’s notebook was open and he was scribbling something on a blank page. Without drawing too much attention to this exciting development, the teacher approached Jalen to see what he was up to. Not only was this the first time Jalen appeared engaged in a classroom activity, but it was also the first time he was motivated to share something he was doing with a teacher. Jalen held up his notebook and showed the teacher what he was working on. It was his idea of a tagline for the Inquiry Lab: “We believe in change.” The teacher knew this was bigger than one assignment or one day of school. On top of all of this, Jalen’s idea became the official tagline of the program by group consensus! For Jalen, this was the start of his journey back into meaningful classroom learning. Jalen’s journey, one we will return to later, among others, is not unique to his experience in the IL. Flexible and responsive learning environments, such as the IL, are essential to improving the learning experiences of all students. This article examines the context of the lived experiences of our students in the 21st century and how to meet their needs through a contemporary understanding of impactful, engaging learning as exemplified in the IL.

2. *The 21st century educational landscape*

Life in the 21st century is vastly different in many ways from the early 20th century, when our current approach to mass education was first established. In modern life, disruptive technologies are emerging on what can feel like on everyday basis. From Uber and Netflix to societal changes such as the work-from-home boom, it is clear that society is experiencing a seismic shift. This drastic change is often conceptualized as a shift from the industrial age to the information age, a shift that necessitates and allows for new ways of educating students to better prepare them with the skills and dispositions needed for modern life [1–3]. In contrast to the traditional standardization or instructionist approach to education in the industrial age [4, 5], learner-centered education (LCE) has emerged as an innovative paradigm of education [6, 7] that can inform the design of education models that address these new student needs and infuse principles and best practices from secular humanism, constructivism, and the learning sciences [8–10]. This review paper explores the intersection of LCE, Universal Design for Learning (UDL) [11], and creative technologies in the IL.

3. *What is learner-centered education?*

As a paradigm of thought, LCE can be a nebulous concept, which leads to significant variations in understanding about what it actually is [12]. In order to better grasp what we mean when we discuss something as “learner-centered,” we must be familiar with its historical context, philosophical roots, and contemporary discussion of LCE. Through this analysis, one can begin to identify a collection of unifying principles that comprise the learner-centered paradigm.

3.1. Historical context and philosophical roots

The structures and practices of our education system, what Tyack and Cuban [13] call the “grammar of schooling,” were devised over one hundred years ago and still exist today in essentially their original form [14, 15]. The existing public education model is so universal and has been the schooling experience of so many people that it has become ingrained in the public consciousness and is now generally assumed to be the correct model, even inevitable [13]. Despite its ubiquity, this model was designed in a different historical context with goals that do not align with the needs or goals of modern society, a mismatch that has been identified for at least 30 years [1].

The development of our current schooling system was heavily influenced by principles of scientific management, popular at the turn of the 20th century [5, 13]. The primary purpose of this educational system was to efficiently sort children into categories perceived to fit their innate abilities and future career paths. There was a

notable fork in the road between those deemed management material and those whose primary responsibilities were conceived as following orders on the assembly line [1, 5].

The artifacts of scientific management still exist in schools today, including features such as sorting students into age-based grades, the siloing of learning into isolated content areas, and the parallel isolating effect of solitary teachers in classrooms [13]. These artifacts have left us with a highly structured schooling experience that is linear, compartmentalized, and bound by strict time requirements [1, 16]. Some argue that this education model promotes hierarchical power structures, resulting in authoritarian classrooms and complicated bureaucratic environments that make it difficult for teachers and students to form meaningful relationships [1, 16]. Although the industrial-age principles of efficiency and standardization prevailed as the guiding concepts for our public education system, there has always been a concurrent line of thinking about what schools could and should be. This alternative, now understood as LCE, was influenced by many notable 20th-century thinkers in the disciplines of psychology and education, including John Dewey, Jean Piaget, Lev Vygotsky, Carl Rogers, and Paulo Friere [8, 12, 17].

The earliest lines of thought that contribute to the modern conceptualization of LCE are humanistic approaches to teaching and learning [5, 8]. In addition to its humanistic roots, the LCE is built on the epistemology of constructivism, in which the learner serves as an active agent in the learning process [17, 18]. As a divergence from the positivist or post-positivist epistemology that informed development of the traditional education model, constructivism was first adopted by those involved in research and development of the learning sciences [2]. It emphasizes the individualized and social nature of knowledge construction [19] as well as the situated, experiential nature of learning [20]. At its core, constructivism implies that learning is more complex and individualized than traditional education systems would lead one to believe; rather than knowledge being delivered by the teacher to the student, knowledge is constructed by the student through active engagement and interaction.

3.2. Common principles of learner-centered education

In the academic and professional discourse around LCE, there are common principles that crystalize the paradigm and can help inform learner-centered transformation, including school and classroom design. Five principles, in particular, can be understood as the core tenets of this approach to teaching and learning.

3.2.1. Principle #1: learning is personalized to account for student individuality

Personalization generally refers to customizing students' learning experiences in order to promote their growth [21] and acknowledge how one's unique collection of

qualities and experiences impacts their learning [22]. Personalization with regard to the whole child, rather than just academic learning, could be considered the hallmark principle of learner-centered education [16]. In the literature, a wide variety of individual characteristics are identified in the rationale for personalizing the learning experience, including differential adolescent development across the domains of the physical, intellectual, emotional, and social, differences in student learning strategies, past experiences, heredity, linguistic background, sociocultural background, perspectives, talents, capacities, needs, dispositions, perceptions, and goals [6, 9, 18, 22]. In a learner-centered environment, these individual differences are not just tolerated, but embraced [8, 16].

The implications for personalization in classrooms include helping students develop goals, task environments, pacing plans, scaffolding, assessment, and reflection, as well as ensuring new concepts are being linked to learners' previous knowledge and experiences [10, 22–25]. Another implication of personalization is that students are not necessarily grouped by age or forced to learn at the same speed as their peers, since each child develops and learns at their own pace [10, 16]. Some sources also reference the use of mastery-based or competency-based grading [10, 24], which is a way of restructuring assessment that allows for personalized pacing and demonstrations of student learning.

3.2.2. Principle #2: learning is situated in authentic experience

Situated learning is a constructivist, research-based [26] approach to learning that involves contextualizing the learning process in learning communities that closely mirror the authentic activities in which those communities participate [20]. The American Psychological Association's principles [22] focus on the importance of experiential learning in general, but other sources emphasize that these experiences should not only be hands-on, but authentic by mirroring activities and goals that exist outside of the classroom context, giving students a sense of how this learning is applied in real-world situations [6, 10, 18]. The social and collaborative nature of learning is another key element of ensuring learning is situated and authentic [6, 22, 24, 27].

3.2.3. Principle #3: educators focus on holistic student growth, including development of transferable skills and dispositions

In learner-centered education, helping students develop skills and dispositions is an essential goal, in line with the humanist ideal of holistic development [8]. An example of a comprehensive list of skills and dispositions is one put forth by Education Reimagined [24], which includes skills such as critical thinking, collaboration, and problem-solving, as well as dispositions including agency, curiosity, adaptability, and leadership. Many of the essential skills referenced in the literature emphasize transferability and creative, critical thinking [8], with a

particular emphasis on self-regulated learning and the related concept of metacognitive thinking [6, 22, 24, 27]. A commonly discussed approach is the repurposing of student assessment as a tool to help students learn and engage in metacognitive reflection [6, 24, 25].

3.2.4. Principle #4: educators create conditions that maximize positive student experiences and affective responses

LCE involves significant consideration of the affective experience of students involved in the learning process. Some have emphasized the importance of creating a safe and comfortable classroom environment [18, 23], while others have focused on the importance of providing emotional support [6] and creating a culture of mutual respect between the teacher and students [25]. The APA emphasizes that motivation influences how much is learned, particularly by aiding the kind of sustained attention necessary for learning complex skills and ideas [22]. Some researchers have identified the teacher's role in cultivating student motivation and engagement [28] and suggest strategies including designing lessons to maximize engagement [25], sharing responsibility with students [23, 27], and other strategies backed by the most current research on motivation and learning [9].

3.2.5. Principle #5: traditional classroom roles and power structures are inadequate

The traditional conception of the teacher as the “sage on the stage” and students as passive recipients of knowledge is eliminated in a learner-centered context. As Colley [23] states, “the focus is less on the teacher and more on the learning process” (p 299). Moreover, traditional power structures, in which the teacher makes most, if not all, of the decisions for students, are also eliminated as teachers take on the primary roles of facilitator and coach [28]. In conjunction with the shifting roles of teachers, students are given the opportunity to take ownership and express their ideas to inform the learning process [8]. Due to the personalized nature of LCE, each learner is given as much independence as possible based on their unique needs and readiness level [24], with the long-term goal of increasing students' abilities to direct their own learning [17].

4. Using LCE to cultivate student creativity

The goal of LCE is to more adequately meet the needs of 21st-century learners. Creativity is understood as an essential component allowing individuals to increase personal satisfaction, drive societal progress, and solve challenging issues [29, 30], making the cultivation of student creativity one of the most important goals of LCE. Furthermore, creativity is a highly sought after skill for future employees across many industries due to the importance of creativity in increasing work performance [29, 31]. This is particularly true in the rapidly changing 21st century, in which innovation is more evident and important than ever [29].

Creativity, as a concept, can be applied to four categories: the process, the product, the person, and the environment [30]. Within the focus of individual creativity, creativity can be defined as one's ability to produce thought and action that is original and appropriate, given contextual needs and limitations [32]. Creativity is also understood as a capability of all individuals that can be intentionally cultivated through educational processes, though traditional approaches to teaching and learning in schools are not conducive to this cultivation [29, 30]. Specifically, Stojanova [30] notes the challenges of developing student creativity when they are so often passive in the educational process and are encouraged towards convergent thinking, searching for a single correct answer to linear and highly structured problems. To better align teaching and learning processes with the development of creative identity, classrooms must foster climates of creativity and collaboration and provide affordances that encourage students' creative thinking and action, such as the integration of creative technologies [30]. This process of developing one's creativity is a deeply personal process tied to their identity.

4.1. The development of creative identity

Creative identity refers to one's conceptualization of their capabilities—as well as the coherence and stability of this conceptualization—as creators [33]. When drilling into the concept of creative identity, a number of more specific conceptualizations emerge. Through a synthesis of wide-ranging interviews with eminent creators, Lebuda and Csikszentmihalyi [33] specifically identified five ways in which one's self-conceptualization of their creative identity can be framed: (a) the fulfillment of one's purpose and potential; (b) the obligation one feels to better their society through creative endeavors; (c) the goal of building and maintaining a stable personal identity; (d) the view of creative work as a challenging craft developed by choice through hard work and discipline; and (e) creativity as a pleasurable escape from one's ordinary life.

In addition to these five ways of framing creative identity, Lebuda and Csikszentmihalyi [33] identify factors that influence the formation of an individual's creative identity. They note that interpersonal factors are essential over the course of an individual's identity development, maintenance, and revision. Positive feedback from mentors and other older, more experienced creators is essential early in this process. Over time, the source of this important feedback and support shifts to younger students, who view the individual as an exemplar of embodied creativity.

The other key factor identified in the creative identity formation process is comparison in two forms: (a) comparison of their creative abilities in the present relative to their abilities in the past and (b) their path of progress relative to those of their peers.

4.2. The LCE principles as a stepping stone to support creative identity formation

In addition to creativity being an essential capability in the learner-centered paradigm, learner-centered principles serve as effective guideposts when considering the development of learner-centered environments conducive to the formation of creative identities. The variety of conceptualizations that may frame one's creative identity [33] highlight the need to support personalized learning paths for students (LCE Principle #1) as they journey through this personal process of identity formation, one in which they require support from teachers serving as mentors, rather than as authoritarian figures (LCE Principle #5). This personalized and supportive approach creates space for learner agency, which leads to divergent thinking and, ultimately, creative thought and action.

The promise of learner-centered approaches for cultivating creative identity are mitigated by the reality that teachers often struggle to implement learner-centered and creativity-cultivating practices [29, 34]. Although the five principles of LCE identified in this article clarify the learner-centered paradigm, they can only serve as a stepping stone towards a framework to translate such approaches into action. Universal Design for Learning (UDL) can serve as an effective framework to create learner-centered environments that support the development of students' creative identities.

5. *Framing learner-centered innovation with UDL*

UDL [35] is a learning design framework based on the premise that all students are capable of learning when provided with a flexible and responsive curriculum [36]. In this framework, the developers include three key elements of flexible learning design: multiple means for students to (a) engage with the learning process, (b) access new knowledge and skills, and (c) express or act on their learning.

As a framework created to provide flexibility and responsiveness in a student's school experience [37], UDL is an ideal framework for designing learner-centered environments, as they are fundamentally built upon personalized learning experiences to meet the unique and diverse needs of all learners. This priority of responding to the needs of every learner is aimed towards the goal of preparing these students for the challenges and opportunities of modern life. The IL that changed the trajectory of Jalen's education journey is one such learner-centered environment. This authentic example, constructed by the author of this article using pseudonyms and vignettes of composite stakeholders' lived experiences, serves to illustrate the natural alignment between UDL and LCE, as well as some of the ways in which the five principles of LCE can be operationalized in schools and classrooms.

6. A learner-centered school-within-a-school

The IL exists as a school-within-a-school (SWS) in a small, Pennsylvania school district, comprised of three schools, an elementary, a middle, and a high school. This district consists of approximately 1500 students [38], 23.2% of whom have individualized education programs and 33.6% of whom are considered economically disadvantaged [39]. In the district, 59.3% of students identify as White, 21.3% as Hispanic, 11.8% as two or more races, 5.1% as Black, 2.2% as Asian, and 0.3% as American Indian/Alaskan Native [39].

In 2018, the IL was designed based on a vision of teaching and learning closely aligned with the learner-centered paradigm that the district developed several years prior. The IL program is conceived as a pilot program to experiment with the operationalization of the district vision and implement learner-centered innovations. In the implementation, the SWS model of the IL means that a portion of the district's middle school students, approximately 25% of the sixth through eighth-grade population, is in the program. The demographic makeup of the students in the IL closely resembles this demographic data of the district as a whole. Because the program is at maximum capacity in its current construction, students apply to join the program. The IL teaching team then speaks with the applicant's current teacher to learn more about them and speaks with the applicant directly. A student's academic history does not play a role in admittance. Rather, students are accepted based on (a) their understanding of what the program actually is, which can be clarified with them during the application process, (b) their level of excitement about joining the program, and (c) their willingness to give their best effort. Although there is undoubtedly some subjectivity in these criteria, the teaching team has honed their evaluation skills over multiple school years to determine how to assess which applicants will be most successful in this learning environment. The program includes both neurotypical and neurodiverse students. This includes students receiving special education or gifted services as well as those who do not receive supplemental services, all of whom are able to flourish.

Regarding curriculum, the program replaces the siloed core classes of social studies, science, math, and English language arts. The IL incorporates all five principles of LCE: (a) personalized learning, (b) authentic, experiential learning, (c) development of transferable skills, (d) maximization of positive student experiences, and (e) the restructuring of classroom power dynamics. As such, the IL was highly influenced by UDL, which promotes the responsive approach to teaching and learning necessary to help students personalize their learning experiences.

6.1. The history of UDL

UDL was originally created by CAST, formerly called the Center for Applied Special Technology, in the U.S. state of Massachusetts in the early 1990s [11].

This framework, based on the concept of universal design in the field of architecture, was built upon evidence from the learning sciences and emerging technological capabilities. The goal of UDL is to help all students learn, regardless of their strengths and areas of need. Within the framework, there are three key aspects of the learning experience: what students learn, how they learn, and why they learn. The “what” of learning refers to the skills and concepts that make up the curriculum. The “how” of learning refers to pedagogical approaches of educators. The “why” of learning refers to the motivation of students and their engagement in the learning process. The implication of the framework is that, by responding to students’ learning needs, all students can make meaningful academic progress.

6.2. Multiple means of engagement in the IL

Engagement, in the UDL framework, refers to the “why” of learning, and the goal is to help students identify their purpose to support their active participation in the learning process. This is a top priority in the IL and is supported by practices aligned with positive student experiences (LCE Principle #3) and revisions to traditional classroom roles and power structures (LCE Principle #5). These principles and their operationalization to support learner engagement are reflected in what are called “choice blocks” within the program. These choice blocks are class periods during which each teacher—referred to in the IL as “learning coach”—facilitates a different activity in their classroom. One coach teaches a conventional lesson on a particular topic, while other classrooms at this time are used for collaborative or independent work on assignments and projects. During these choice blocks, learners select which room and activity they will join. This process is accomplished through a shared Google Sheet [40], in which each learner has edit privileges for only their own row, in which they select their room of choice. This selection process empowers learners to take ownership of the learning process with the goal of cultivating engagement.

To further build learner engagement, the IL emphasizes mastery-based feedback, with Canvas Learning Management System [41] serving as the interface through which work is submitted and feedback is returned, in addition to in-person feedback from both peers and learning coaches. In this mastery-based system, learners are able to resubmit work after they receive feedback on an initial submission. Feedback and assessment are ongoing and formative, cultivating in students the mindset that learning is a continuous process of reflection and growth. As an extension of this mastery-based system, learners are able to select which assignments or projects they complete in a given marking period, as long as they have achieved the cumulative number of points expected for each subject. These points can be earned through individual assignments, ongoing projects, or, most often, a combination of the two. This flexibility further builds learner ownership and independence as they reflect on their progress and identify what they need to do to achieve their goals for the marking period.

6.3. Multiple means of representation in the IL

Representation in UDL refers to the ways in which new information is presented to students. Within the IL program, means of representation are intentionally varied. New information is presented through video, using tools such as EdPuzzle [42] and YouTube [43], through articles and pictures, with tools such as Newsela [44], and through more traditional means such as interactive presentations led by the learning coach and frequently built in Google Slides [45]. Additionally, students are able to select the degree of difficulty when learning new skills and concepts, with three assignment levels roughly corresponding to 6th, 7th, and 8th-grade state learning standards. This allows them to select their work based on prior learning. With each assignment, the complexity of information in available resources is varied to allow students, whether they have non-existent or significant background knowledge or experience, to take a step forward in their understanding.

6.4. Multiple means of action and expression in the IL

In the IL, there is a growing repository of creation tools available to learners, allowing learners to express their learning through various media. This repository serves as an important form of institutional knowledge within the program, with new tools identified and shared by learners and coaches alike. These creation tools include web applications like Book Creator [46] and Loom [47], as well as MacOS tools such as iMovie [48] and GarageBand [49]. Collectively, these tools allow students to create eBooks, digital presentations, short films, songs, podcasts, and more. Deeper expressions of learning are cultivated by encouraging learners to extend individual assignments into projects, applying their new knowledge and skills to achieve novel and personalized (LCE Principle #1) goals. These projects are designed by learners and allow them to apply and develop their knowledge and skills experientially (LCE Principle #2).

The project design process is structured via a project proposal template (see figure 1). This template, constructed in Google Docs [50], guides learners through the process of setting project goals and organizing the steps or stages of the project. A learner begins by brainstorming their project and adding their notes to a copy of this template, sometimes with support from peers or coaches. Next, the learner submits the proposal to a learning coach, who gives initial approval or provides feedback for revising the project design before the learner implements the project plan. This project proposal and the aligned project development process are vital innovations used in the IL to help learners develop their creative identities. Creating their own learning experiences also helps them develop important transferable skills (LCE Principle #3), such as project planning and goal setting.

Name: _____ Date: _____ Grade: _____

Inquiry Lab Project Proposal

Summarize Your Project Idea:

Circle/Highlight All That Apply:

My project is focused on...		
A <u>problem</u> I want to do something about.	An <u>interest</u> of mine that I want to explore more deeply.	A <u>question</u> I want to explore.

Describe How Your Project Connects to Academic Subjects (science, math, ELA, social studies):

My project is connected to the following academic subject(s):

The topics within the stated academic subject(s) I'm most interest to learn about are:

List the Resources You Will Use to Learn about These Topics:

List the Major Steps or Stages of this Project:

Circle/Highlight the Learning Artifacts You Will Create During this Project:

If my project goes according to plan, I will have made the following (circle/highlight all that apply and explain in the empty boxes below these categories):				
Video, audio, or pictures of what I have done	A physical object	A digital object	Writing (Creative, Informative, Argumentative, and/or Research Notes)	Other

Describe What Circumstances Would Result in You Moving on From this Project Prior to Completion:

Figure 1. The Inquiry Lab project proposal template.

7. Program outcomes

The innovations of the IL are connected to the UDL principles of providing multiple means of engagement, representation, and action and expression. This flexible structure is represented in the choices students have in crafting their learning experience, with support and guidance from educators. This approach has helped students develop as independent, confident, and capable learners and creators, capable of navigating the demands and opportunities of life in the 21st century. To illustrate these points, we now return to Jalen, and what he experienced in the IL after that fateful morning when he created the program's tagline.

Over Jalen's three years in the program, during which he was exposed to a flexible and responsive learning environment aligned with UDL and LCE, he flourished as a learner and creator. He brought his passion for drawing into the classroom, illustrating his favorite cartoon characters and, with permission from the learning coaches, hanging these pictures around the classrooms. This form of expression, while not tied to a particular assignment, supported the development of his creative identity. He also led a yearly apparel sale to raise funds for the IL. His "why" for this project was to help provide the materials that he and his classmates would need for projects and to express himself creatively. This apparel sale featured a sweatshirt with an IL logo he had designed. He, with the support of a learning coach, met with local clothing makers to finalize the design and sell these sweatshirts to IL students and their families. This developing business acumen has now led him, as a high school student, to start his own lawn care business.

Other students have been similarly impacted after joining the IL. One student, Tom (pseudonym), who had been diagnosed with autism spectrum disorder (ASD), came into the program with a strong creative impulse. However, he was prone to intense bouts of frustration and sadness when presented with structure or given constructive feedback. These strong, negative reactions made it difficult for him to channel his creativity effectively. His first year in the program was marked with extreme swings in his academic achievement and affective disposition.

Over time, he became more responsive to feedback as he adjusted to classes in which feedback was ongoing and formative. He was able to use his creativity to design his own approaches to acting on and expressing his learning, leading to a variety of impressive and challenging projects. In one such series of projects, he presented to other students in the IL—approximately 70 peers—his original multimedia narratives animated in MacOS's Keynote [51]. In another series of projects, Tom used his analytic and mathematical thinking skills to visualize and tell rich stories using data he collected from actual observations within the IL classrooms. His observational skills and ability to convey social science findings in interesting and often humorous ways was a reflection of his developing creative identity, which was unleashed through a learner-centered environment that encouraged him to build his own learning path to engage with, interact with, and express his knowledge and learning.

Another student, Sylvia (a pseudonym), came into the program looking for a more challenging learning experience. She had been in the district's gifted program since second grade and often felt bored and disengaged during class. Her reflective nature and cognitive skills meant she desired and required academic challenges significantly above other students her age. Although some additional challenge was provided through supplemental gifted programming, she was still locked into the same pace of learning as her peers in her other classes.

As a high-achieving student, the autonomy she was granted in the IL was difficult for her at first, since she was accustomed to very successfully and quickly completing assignments given to her by a teacher in a linear, structured curriculum. As she became more comfortable with this autonomy and developed her skills as the lead designer of her learning experience, she flourished in a way she never had before. To further extend her learning, she participated in massive open online courses (MOOCs) through Coursera [52], applying her learning to projects she designed and executed in the IL. She also spoke at a school board meeting about the importance of creating more flexible, learner-centered opportunities in the rest of the school district and beyond. Sylvia's success in the program even allowed her to finish middle school a year early, becoming the district's first student on record to skip a grade through accelerated learning.

8. Conclusion

If the principles of learner-centered education outline the contours of effective learning environments for the 21st century, then UDL is the structure upon which we can build learning environments infused with these principles. By utilizing UDL to bring LCE to life in schools, we can cultivate the development of students' creative identities and increase their likelihood of success and fulfillment during their years of formal education and beyond. The efficacy of this approach to teaching, learning, and school design is reflected in the Inquiry Lab and the stories of students such as Jalen, Tom, and Sylvia.

Suppose this evidence is enough to convince one of the importance of catalyzing learner-centered school systems across the world. In that case, a question arises: How do we actually make this happen, create a world in which LCE is the norm, rather than an add-on? And once again, the IL serves as a fitting example. In this school district, the only limit to the growth of the IL is the readiness of parents, teachers, and other stakeholders tasked with making decisions in the district context. Slowly but surely, with the presence of the IL, more and more adults involved in the district are being exposed to this new approach.

This highlights that building capacity for this reimagining of teaching and learning in adults is the tipping point for widespread change. Through ongoing and meaningful professional development for teachers and more informal learning opportunities for parents and others, LCE can become a driving force in educational design and decision-making. Building capacity is likely to be challenging, time-consuming and, often, thankless. However, the benefits of flexible and responsive learning environments for students far outweigh these challenges. This reinvention of education is possible through conversation and training, guided by essential tools like the UDL framework and principles of LCE. For those just beginning or currently on this journey, I encourage you to keep the vision of

learner-centered education in your mind and adopt your own version of Jalen's tagline: "We believe in change."

Conflict of interest

The author declares no conflict of interest.

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