Personalized Learning for Global Citizens

Transformation Framework
Introduction

This paper examines one of ten critical components of effective transformation in schools and education systems. Each paper is produced by an expert author, who presents a global perspective on their topic through current thinking and evidence from research and practice, as well as showcase examples. Together, the papers document the contributions of ‘anytime, anywhere’ approaches to K-12 learning and explore the potential of new technology for transforming learning outcomes for students and their communities.

Personalized Learning for Global Citizens

Personalized learning is neither a new concept, nor a complete departure from established education practice. The concept has resurged in recent years as educators have recognized the merits of technology’s role in facilitating cost-effective personalized learning and bringing it to scale. Around the world, technology is allowing schools to design customizable learning pathways for individual students and provide data-rich feedback cycles for teachers and students. Today, when educators think of personalized learning, they think of students choosing courses, goals, and pathways to achieve those goals. They think about the use of technologies that will allow for the customization of personalized learning paths for students by way of data dashboards that help students navigate through their learning. In this paper, we highlight the research on personalized learning, provide examples of personalized learning facilitated by technology, and offer guiding principles for leaders and educators who are planning personalized learning programs.

What is the Education Transformation Framework?

The Microsoft Education Transformation Framework helps fast track system-wide transformation by summarizing decades of quality research. It includes a library of supporting materials for ten components of transformation, each underpinned by an executive summary and an academic whitepaper detailing global evidence. This provides a short-cut to best practice, speeding up transformation and avoiding the mistakes of the past. Microsoft also offers technology architectures and collaborative workshops to suit your needs.

About the authors

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Personalization isn’t new. It’s based on decades of theory.

In the last few years, personalized learning has become a popular topic in education circles around the world. Major theories and hypotheses including constructivism,

The International Association for K-12 Online Learning envisions personalized learning as “tailoring learning for each student’s strengths, needs, and interests – including enabling student voice and choice in what, how, when, and where they learn – to provide flexibility and supports to ensure mastery of the highest standards possible.”

In the early 20th century, two educational movements in the United States helped to set the stage for personalized learning. The first was the Winnetka Plan of 1919, which focused on the “whole child” and his/her physical, emotional, social, and intellectual education. The Winnetka Plan used mastery learning and required the student to become competent in the content before moving onto the next concept.

In 1970, the term personalization was coined by Victor Garcia Hoz in his work Personalized Education. According to Hoz, personalization is the learner’s journey to developing their freedom of choice. Hoz believed that the learner should be in control of his/her life experiences. Similar to the Winnetka and Dalton Plans, Hoz felt that the learning environment should be cognizant of the learner’s cognitive, affective, and social-emotional development. Based on Hoz’s work, personalized education had two objectives:

• Learning goals should be created with input from the learner and should be based on the following personal developmental characteristics, including learner preferences, creativity, freedom, originality, autonomy, socialization, and communication; and

• Learning environment and activities should be organized around the learner, and the work should be designed to allow for student control of learning where the student can create and discover by using a variety of learning resources. Teachers guide the autonomous learning of the student.

Personalization refers to instruction that is paced to learning needs, tailored to learning preferences, and tailored to the specific interests of different learners.

The evidence behind personalization

Having laid the historical, theoretical, and semantic groundwork for personalized learning, we next take a look at the important practical evidence base that exists to support it. A large part of the research that has been done for personalized learning was compiled by the UNESCO International Academy of Education’s International Bureau of Education in their publication on How Children Learn. Within this publication is a list of 12 elements of personalized learning, each of which was supported by research.

The 12 elements of personalized learning are discussed in this paper, in conjunction with their research base. A few of the elements are combined due to their close relationship with one another. Also included, where available, are examples of current practices in schools.

The 12 elements of personalized learning

1. Active involvement
2. Social participation
3. Meaningful activities
4. Relating new information to prior knowledge
5. Being strategic
6. Engaging in self-regulation and being reflective
7. Restructuring prior knowledge
8. Aiming towards understanding rather than memorization
9. Helping students learn to transfer
10. Taking time to practice
11. Developmental and individual differences
12. Creating motivated learners

1 Piaget, 1985
2 Piaget, 1985
3 Orkwis & McLane, 1998
4 Lave & Wenger, 1991
5 Siemens, 2014
6 Anderson & Krathwohl, 2001
7 Vosniadou, 2001
8 Webb, 2005
9 Dill, p. 18
10 Patrick, Kennedy, & Powell, 2013, p. 4
11 Butts & Cotton, 1952; Calabresi, 1947; Guzek, 1986
12 Dewey, 1932
13 Hoz, 1982; Hoz, 1987
14 Vosniadou, 2001
Active involvement is key to inspiring creativity, self-reliance, problem-solving, and decision-making.

More active understanding, less rote memorization

Learning requires the active and constructive involvement of the learner in applied learning situations. The maker movement, a trending topic around the world inspired by Dewey’s learning by doing and Papert’s learning by making, is an example of a learner’s active involvement in their educational experience. From the Homebrew Computer Lab of the 1970s to Code.org’s Hour of Code, and student events like Imagine Cup, the idea of active involvement is key to inspiring creativity, self-reliance, problem-solving, and decision-making in learners.

Another way to promote active learning is project-based learning, which encourages students to explore real-world problems by working through the possible solutions. For example, a group of seventh graders at King Middle School in Portland, Maine, worked with science experts to understand bacteria and how it impacts their lives. The students reported their findings to the wider community in an e-pamphlet (Edutopia.org). The project incorporated multiple disciplines – science, math, language arts, social studies, art, and multimedia – which also contributes to active learning.

Learning is more authentic when it is organized around general principles and explanations, rather than the memorization of isolated facts and procedures. Project-based learning and other applied learning strategies help us move beyond the testing structures that focus on memorization, instead emphasizing understanding. Companies such as Pacific Metrics, Smarter Balanced Assessment Consortium (SBAC), and the Partnership for Assessment of Readiness for College and Careers (PARCC) are developing new technologies that allow for better assessment of students’ understanding.

Social participation

Using negotiation and social skills to help students learn

Learning is a social activity and participation in school social life is crucial. According to learning theory, negotiation in learning helps students understand what they are learning. Conversations and shared understanding is key. Social participation has been strongly related to self-efficacy, respect for diversity, self-confidence, collaborative skills, avoidance of risk behaviors, and resilience.

Forward-thinking schools are giving students a voice in systemic improvement - even involving them in service learning at the community level. For example, a group of visually impaired students in West Virginia raised money for a local animal shelter by producing, packaging and marketing their own dog biscuits.

A 3rd/4th grade classroom in Michigan are using online and community-based social strategies to try and get the Northern Spring Peeper frog adopted as their state amphibian. This exploded to a multi-faceted learning immersion project spanning government, language arts, visual arts, interviewing, communications, and social media. Students have written formal letters, lobbied their local Representative, held radio interviews, created brochures, engaged local businesses, campaigned at events, created T-shirts, and built a Facebook page.

Recently, “serious games” are providing a way for students to engage in both meaningful learning and collaboration. In Robotics clubs, students work together to build a robot they will enter in a competition. Online learning helps to expand their social circles, connecting them to peers beyond their school.

Another example is the Deeper Learning MOOC where students at High Tech High worked with green housing, energy efficiency and construction experts to build an energy efficient house.

In computer science, Pair Programming helps further learning by letting students build programs in pairs. This is often supported by Kodu Game Lab.

Consolidating knowledge through relevant activities

People learn best when they participate in activities that seem useful and culturally relevant. Relevance helps bridge the gap between what students are doing in school and what they do in life, which builds more authentic learning and better transfer of knowledge. Learning becomes more meaningful when the lessons are applied to real-life situations.

For example, Michigan Virtual School (MVS) connects its students together with students in England for a Global Issues course. This requires co-teachers: One from MVS, one from England. The course exposes students to worldwide issues such as global warming and hunger, illustrating differences in perspective, culture, proposed solutions and scale. This deepened conversation helped students create an impact plan, bringing their learning to life.

In addition, authenticity, learning needs to be culturally relevant. This is sometimes called culturally appropriate, culturally congruent, culturally responsive, and culturally compatible.

In culturally relevant learning environments, students are engaged in activities that help them learn about and develop their understanding of their own culture, and are encouraged to be critically conscious of cultural norms, institutions, and values.

Culturally relevant education can be incorporated into all disciplines. For example, in physical education courses we can introduce culturally-based games like Mulambilwa, an African bowling and running game, Kho-Kho, a chase game originating in India, Yemari, a Japanese handball game, and La Pelota, a Mexican ball game.

Forward-thinking schools are engaging their students as stakeholders in the school and providing them a chance to have a voice in systemic improvement.

Meaningful activities and helping students transfer

Within culturally relevant learning environments, students have the access and equity that help them to attain academic success.

16. See makerfaire.com or d-sys.org.
36. Mcintyre & Erickson, 1981.
Relating new information and restructuring prior knowledge

Making sense of the learning experience
Learning is partly the acquisition and construction of knowledge, built on the foundation of what is already understood. This is key to comprehension – requiring students to make sense of their learning experiences in the context of what they already know and recognizing these experience build on one another. When this understanding and recognition does not happen, prior knowledge can stand in the way of learning something new.

To overcome this, students must learn how to solve internal inconsistencies and restructure existing conceptions when necessary. One activity that helps is “think-pair-share” in which students have to think about the topic-at-hand silently, then pair up with a partner to talk about what they thought, and then share this with the class.

This could be done when learning a new coding language. While the specific commands and structures may be different, many coding languages are based on basic logical equations (if/then statements) and follow the same logical principles, meaning that students may draw on the prior knowledge learned from one coding language to understand the basics and provide a foundation for learning the new language.

Another tool is Minecraft, which helps students use the knowledge in their ‘real life’ to take care of themselves in the game. In playing, their prior knowledge is sometimes questioned, and they have to restructure it with the new information from the game.

Students can build on knowledge through games like Minecraft, which helps students use the knowledge that they have acquired in their life to take care of themselves in the game.

Powering up critical thinking
People learn by employing effective and flexible strategies that help them to understand, reason, memorize, and solve problems. One of the keys to being strategic is thinking critically. Critical thinking is required for questions that do not have simple answers; in asking such questions educators can promote critical thinking in learners.

Some learning programs are taking it one step further and preparing students to be strategic by teaching them computational thinking.

Several programs have been developed to foster computational thinking including (but not limited to) MIT’s Scratch, Carnegie Mellon’s Alice, Microsoft’s Kodu and University of Kent’s Greenfoot. Code.org is a non-profit is working to provide widespread and easily accessible opportunities to learn coding as well.

Additional examples of fostering strategic thinking in schools around the world also includes mindmapping with technology tools, such as NovaMind Mind Mapper and online journaling in OneNote. These types of activities have come to fruition within blended learning spaces around the world.

Self-regulation and being reflective

Managing where students are headed and where they’ve been
Learners must know how to plan and monitor their learning, how to set their own learning goals, and how to correct errors. Self-regulation is the knowledge and skills that allow learners to reflect upon and respond to their surroundings based on what they see, hear, touch, taste, and smell, and to compare that perception with what they already know.

Research has shown that increasing students’ self-regulation results in increased comprehension and achievement. Self-regulation processes include self-monitoring, self-instruction, self-evaluation, self-reflection, self-correction, and self-reinforcement. There are a few common strands across self-regulated learning theories. The first is that learners must have an active role in developing their skills and knowledge towards their learning goals. The second is that self-regulation is an iterative process where the learner sets goals, decides how to achieve those goals, monitors to see how the process is going, and then changes the course of action if something is not working effectively.

The third idea is that motivation plays a key role in learning, and external motivators may need to be used until intrinsic motivation develops.

As Cavanaugh points out, “Blended programs are most effective when they use technology to increase individualization and opportunity for reflection on learning.”

In an AP Macroeconomics course at MVS, students were directed to resources in a shared virtual space and tasked to discover which resource was most useful to them.

Another teacher in Michigan, Tara Maynard, was featured on the MyBlend website for using a flipped classroom model in her 8th grade math class. Her students learn content and take notes outside of the course via videos and other resources, and then when they get to class, put their learning to practice.

When students have questions, Ms. Maynard can respond and personalize.
Taking time to practice

Learning is a complex activity that cannot be constrained to a specific time limit. It requires considerable and variable time and periods of deliberate practice to start building expertise in an area. Some research emphasizes that it takes 10,000 hours to become an expert on something. Other researchers emphasize that there are other factors involved beyond deliberate practice that need to be taken into account. Two key factors are time spent in deliberate practice and the spacing between practice sessions (to avoid burnout).

A key piece to personalized learning is creating personalized pathways for learners and going beyond the seat-based time that is allotted in traditional school days. In practice, this takes the form of students designing their own learning plan based on their current knowledge, learning needs, and future goals, allotting the time they need for each content area. Instead, some states are looking more to use Universal Design for Learning (UDL) which is a framework designed to meet the needs of all students. There are three principles of UDL and their subsequent guidelines and checkpoints are detailed below. The research evidence for all Checkpoints can be found on the UDL Center website: www.udlcenter.org.

Creating motivated learners

Another way students are personalizing their learning is by creating paths that work for them. An example of this is Personalized Learning Environments (PLEs), investigated as an application of Drexler’s networked learner, and effective for complex collaborative learning. In a PLE, the student selects the tools and communities that will best meet his or her learning objectives. Allowing students to choose their own path or have choice in their learning motivates them to continue learning.

Dialoging up engagement levels

Learning is critically influenced by learner motivation. Teachers can help students become more motivated learners by their behavior and the statements they make. Some research-based strategies for motivating learners include becoming a role model for student interest; getting to know students; using examples freely; being a role model for student interest; getting to know students; using examples freely; being a role model for student interest; getting to know students; using examples freely; and beyond delimiting practice that need to be taken into account. Two key factors are time spent in deliberate practice and the spacing between practice sessions (to avoid burnout).

A few examples of technologies that could help students with practicing could be collaborative projects with peers and mentors in cloud-based conferencing tools. Simulations, which have a long history in medicine and business training, are also excellent examples that offer unlimited practice on many tasks that are difficult with physical materials, continuous advances in digital technology also afford more realistic, complex, and socially connected simulations.

Online learning also allows students mobile access to learning content 24-7, provides students the opportunity to go at their own pace, and specifically, asynchronous learning gives them the chance to practice and re-practice, which is something that we have not been able to replicate in the traditional classroom.

Universal design for learning: principles, guidelines, and checkpoints

New within the last year at Khan Academy is their Learning Dashboard that allows students to identify their areas of strength and where they need improvement, as well as see their progress and reorganize their learning path. At Summitt Public Schools, students create their own playlists that include courses, course content, and resources for learning in order to master content knowledge. At Michigan Virtual Learning Research Institute (MVLRI), the researchers are looking at ways to visualize student data to help teachers identify students who are struggling.

Principle | Guideline | Checkpoints
--- | --- | ---
Provide multiple means of representation | Provide options for perception | • 1. Offer ways of customizing the display of information
• 1.2: Offer alternatives for auditory information
• 1.3: Offer alternatives for visual information
Provide options for language, mathematical expressions, and symbols | • 2.1: Clarify vocabulary and symbols
• 2.2: Clarify syntax and structure
• 2.3: Support decoding of text, mathematical notation, and symbols
• 2.4: Promote understanding across languages
• 2.5: Illustrates through multiple media
Provide options for comp | • 3.1: Activate or supply background knowledge
• 3.2: Highlight patterns, critical features, big ideas, and relationships
• 3.3: Guide information processing, visualization, and manipulation
Provide multiple means of action and expression | Provide options for physical actions | • 4.1: Vary the methods for response and navigation
• 4.2: Optimize access to tools and assistive technologies
Provide options for expression and communications | • 5.1: Use multiple media for communication
• 5.2: Use multiple tools for construction and composition
• 5.3: Build fluencies with graduated levels of support for practice and performance
Provide options for executive functions | • 6.1: Guide appropriate goal-setting
• 6.2: Support planning and strategy development
• 6.3: Facilitate managing information and resources
• 6.4: Enhance capacity for monitoring progress
Provide multiple means of engagement | Provide options for recruiting interest | • 7.1: Optimize individual choice and autonomy
• 7.2: Optimize relevance, value, and authenticity
• 7.3: Minimize threats and distractions
Provide options for sustaining effort and persistence | • 8.1: Heighten salience of goals and objectives
• 8.2: Vary demands and resources to optimize challenge
• 8.3: Foster collaboration and community
• 8.4: Increase mastery-oriented feedback
Provide options for self-regulation | • 9.1: Promote expectations and beliefs that optimize motivation
• 9.2: Facilitate personal coping skills and strategies
• 9.3: Develop self-assessment and reflection

Developmental and individual differences

Children learn best when their individual differences are taken into consideration. There is a need for learning to be designed to meet the developmental and individual differences and needs of all students. One way in which many schools are approaching this is to use Universal Design for Learning (UDL) which is a framework designed to meet the needs of all students. There are three principles of UDL and their subsequent guidelines and checkpoints are detailed below. The research evidence for all Checkpoints can be found on the UDL Center website:

1.1: Offer ways of customizing the display of information
1.2: Offer alternatives for auditory information
1.3: Offer alternatives for visual information
2.1: Clarify vocabulary and symbols
2.2: Clarify syntax and structure
2.3: Support decoding of text, mathematical notation, and symbols
2.4: Promote understanding across languages
2.5: Illustrates through multiple media
3.1: Activate or supply background knowledge
3.2: Highlight patterns, critical features, big ideas, and relationships
3.3: Guide information processing, visualization, and manipulation
4.1: Vary the methods for response and navigation
4.2: Optimize access to tools and assistive technologies
5.1: Use multiple media for communication
5.2: Use multiple tools for construction and composition
5.3: Build fluencies with graduated levels of support for practice and performance
6.1: Guide appropriate goal-setting
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6.3: Facilitate managing information and resources
6.4: Enhance capacity for monitoring progress
7.1: Optimize individual choice and autonomy
7.2: Optimize relevance, value, and authenticity
7.3: Minimize threats and distractions
8.1: Heighten salience of goals and objectives
8.2: Vary demands and resources to optimize challenge
8.3: Foster collaboration and community
8.4: Increase mastery-oriented feedback
9.1: Promote expectations and beliefs that optimize motivation
9.2: Facilitate personal coping skills and strategies
9.3: Develop self-assessment and reflection
Key strategies for deploying personalized learning

Using the research already discussed, the following provides components for creating personalized learning environments for K-12 students:

1. Create learning environments that allow students to be actively involved in their learning process. Incorporating project-based learning (PBL) is just one example of this.
2. Assess students in meaningful ways where they can apply their understanding.
3. Encourage students’ social participation in both classroom/learning environment spaces, school communities, as well as the community at large outside of the students’ learning space.
4. Engage students in meaningful activities that are culturally relevant and true-to-life.
5. Scaffold students to support the transfer of knowledge from one context to another.
6. Foster students’ use of their prior knowledge to build an understanding for new knowledge.
7. Urge students to think critically about prior knowledge that does not fit a new concept, and inspire them to restructure their thinking to arrive at a new understanding.
8. Nurture and promote students’ use of strategic, critical thinking skills for solving problems with creative solutions.
10. Compel students to practice when they want to become experts in a given area.
11. Give students multiple opportunities for representing, acting, expressing, and engaging in their learning.

Personalized learning through Microsoft’s Transformation Framework

Personalized learning is a promising path to differentiate learning for all students and prepare them for college, career and community in the 21st century. In today’s mobile and cloud enabled personalized learning environments, the technology is adaptive so students get individually flexible and responsive path, pace, and pedagogy according to their needs, interests, and choices. The technology provides data used by teachers in crafting learning plans for each student.

Effective personalized learning environments provide tools and learning resources that students use in self-directed and self-paced learning. Learner engagement and independence are core goals. Integrated and engaging technology tools can amplify knowledge acquisition, skill development, and application of learning in comprehensive tasks. Adapting the pace and pedagogy require access to content and tools for learning anytime, anywhere, and on any device. Because learning is deepest with guidance and interaction, the content and tools should be collaborative.

Why hasn’t personalized learning been realized?

The U.S. Department of Education’s Race to the Top District-level grant (RTT-D) awardees provide numerous examples of school districts making the switch to personalized learning. The winning districts had six key strategies that they used to implement personalized learning:

1. Data and data systems that allow for longitudinal/historical student data and formative data for teachers to use to differentiate for each student.
2. Curriculum and teaching that were not time-based and that allowed students to interact with content in multiple ways.
3. Learning materials that allowed for digital books, Open Educational Resources (OER), virtual manipulatives, and adaptive tools for personal paths.
4. Repurposed learning facilities that would allow for more flexible learning in changeable environments.
5. Human capital to understand what personnel is needed and how they are most effectively utilized, and
6. Professional development to arrive at a place together as a learning team to make learning student-centered and personalized.

Many more schools districts like the RTT-D winners are out there, moving towards personalized education for each student. Despite these districts’ major efforts and the efforts of others, personalization of learning is not as pervasive as we would hope it to be. Given the practical advances and research base, why hasn’t personalized learning been realized?

One of the greatest challenges for personalization in schools is that it is not implemented in a way that it can be brought to scale, typically due to such issues as human capital limitations, lack of access to necessary resources, and resistance to change, to name a few. Ultimately, personalized learning can be wholly realized when there is a systemic change made within schools, districts, and education-at-large; it is our responsibility as educators to work to put these research-based elements into motion in our early, middle, and secondary schools so our students’ true potential can be realized.
Personalized Learning for Global Citizens

Developing your own change strategy
Guiding questions for Personalized Learning

- Does the complete learning experience prepare school leaders for college, career, and community?
- Does the learning environment drive students and teachers to be better leaders for life?
- How adaptive learning is supported with data analytics?
- What software accessibility requirements are needed?
- What personalized learning requirements are needed for staff/students?
- How are students and teachers enabled with collaborative, creative, and productive learning?
- How is differentiated instruction supported and enabled?
- How well are we prepared to mix school or workstyle with lifestyle learning?
- Does School@home mean for students?


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