Research Report

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Teresa M. Ober
Blair A. Lehman
Reginald Gooch
Olasumbo Oluwalana
Jaemarie Solyst
Geoffrey Phelps
Laura S. Hamilton

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RESEARCH REPORT

Culturally Responsive Personalized Learning: Recommendations for a Working Definition and Framework

Teresa M. Ober[1], Blair A. Lehman[1], Reginald Gooch[1], Olasumbo Oluwalana[1], Jaemarie Solyst[2], Geoffrey Phelps[1], & Laura S. Hamilton[3]

1 Educational Testing Service, Princeton, New Jersey
2 Carnegie Mellon, Pittsburgh, Pennsylvania
3 American Institutes for Research, Arlington, Virginia

Culturally responsive personalized learning (CRPL) emphasizes the importance of aligning personalized learning approaches with previous research on culturally responsive practices to consider social, cultural, and linguistic contexts for learning. In the present discussion, we briefly summarize two bodies of literature considered in defining and developing a framework for CRPL: technology-enabled personalized learning and culturally relevant, responsive, and sustaining pedagogy. We then provide a definition and framework consisting of six key principles of CRPL, along with a brief discussion of theories and empirical evidence to support these principles. These six principles include agency, dynamic adaptation, connection to lived experiences, consideration of social movements, opportunities for collaboration, and shared power. These principles fall into three domains: fostering flexible student-centered learning experiences, leveraging relevant content and practices, and supporting meaningful interactions within a community. Finally, we conclude with some implications of this framework for researchers, policymakers, and practitioners working to ensure that all students receive high-quality learning opportunities that are both personalized and culturally responsive.

Keywords culture; social topics; languages; culturally responsive; personalization; diverse students; digital learning; technology-enabled tasks

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Serving the needs of students from a diverse range of social, cultural, and linguistic backgrounds and who bring a variety of experience into the classroom has become increasingly important because of several major shifts in the landscape of K–12. As the population of K–12 students in the United States becomes more diverse (National Center for Education Statistics [NCES], 2019), teachers need support implementing instructional practices that acknowledge and support learning within various social, cultural, and linguistic contexts (Hussar & Bailey, 2020). Despite the apparent rise in political polarization surrounding K–12 classroom teaching, particularly in relation to social and cultural topics, in classroom settings (Fitzgerald et al., 2021; Jordan Irvine, 2018), many state teaching standards throughout the United States already reflect an imperative for teaching in a culturally responsive manner. For example, one recent review of state standards across all 50 states found that nearly all state teaching standards emphasize the importance of teachers maintaining respect for differences and diversity, nearly three quarters include competencies related to teachers' use of culturally and linguistically appropriate communication, and just over half of all states include teaching competencies that require teachers to reflect on their own cultural lens and potential biases (Muñiz, 2019). Classroom teaching is improved when teachers are prepared to respond to a variety of students' cultural backgrounds, including the knowledge and skill sets developed through their unique cultural experiences (González et al., 2006). In practice, it is extremely challenging for teachers to maximally support students with such varied strengths. To do so would require instruction that is personalized to individual students based on their existing knowledge and skills as well as social, cultural, and linguistic backgrounds. Although many state teaching standards specifically call attention to the benefits of personalized learning in state-specific education plans to address the needs of all students, there remains little consensus about what scalable personalized learning looks like in the classroom or how to implement it (Zhang et al., 2020), let alone in a manner that leverages the benefits of culturally responsive teaching.

Corresponding author: T. M. Ober, E-mail: tober@ets.org

In the present discussion, we provide an overview of relevant literature on theory related to personalized learning and culturally responsive pedagogy, which are defined in subsequent sections. We then provide a definition and framework consisting of six key principles of what we refer to as *culturally responsive personalized learning* (CRPL), along with recommendations for practice. Finally, we conclude with some implications of this framework for researchers, policymakers, and practitioners working to ensure that all students receive high-quality learning opportunities that are both personalized and culturally responsive.

Defining CRPL

CRPL expands existing conceptualizations of personalized learning by further considering social, cultural, and linguistic contexts for learning. In defining and developing a framework that articulates the CRPL approach, we draw from two bodies of literature: personalized learning (see Bernacki et al., 2021) and culturally relevant, responsive, and sustaining pedagogy (see Gay, 2018; Ladson-Billings, 2009; Paris, 2012). The CRPL approach acknowledges that teaching and learning occur in a social context and that the relationships and interactions students experience are critical aspects of the learning environment.

CRPL aims to ensure high-quality, culturally relevant learning opportunities for all students to promote academic, social, and emotional development and student agency. CRPL can provide a framework for the design, development, and implementation of various technologies (e.g., mobile devices, artificial intelligence, digital platforms) that can provide personalized learning opportunities in a more culturally responsive manner. Therefore,

> *CRPL is an approach to teaching and learning that acknowledges how students' personal, social, cultural, and linguistic contexts influence their educational experiences and their opportunities to benefit from instruction and that adapts instruction based on students' strengths while striving to meet individual students' needs within those contexts.*

Background Literature

As noted previously, we focused our review on two main aspects of the approach: personalized learning (see Bernacki et al., 2021) and culturally relevant, responsive, and sustaining pedagogy (see Gay, 2018; Ladson-Billings, 2009; Paris, 2012). Our goal is to draw on and integrate these two areas to conceptualize CRPL. While research in each of these areas is expansive, in this section we present an abbreviated synthesis of key ideas across these research areas. We draw from these bodies of literature to develop a set of key principles of CRPL.

Personalized Learning

Though in practice, personalized learning has been defined in a variety of ways (Zhang et al., 2020), we chose to adopt this definition:

> Personalized learning prioritizes a clear understanding of the needs and goals of each individual student and the tailoring of instruction to address those needs and goals. These needs and goals, and progress toward meeting them, are highly visible and easily accessible to teachers as well as students and their families, are frequently discussed among these parties, and are updated accordingly. (Pane et al., 2017, p. 6)

The benefits of personalized learning have been widely recognized, even long before the widespread use of modern technologies for personalized learning. For example, one-to-one tutoring has long been known to facilitate learning through providing personalized learning (Bloom, 1984; Cohen et al., 1982; VanLehn, 2011). There is extensive evidence that tutoring programs can be effective in supporting improvements in K–12 students' learning in reading (Elbaum et al., 2000) and math subject areas (Nickow et al., 2020; Pellegrini et al., 2021). Placing a learning task within a context that a student is likely to already have familiarity or interest in can promote engagement and learning (Hidi & Renninger, 2006). Tapping into students' situational interest in this manner is thought to lead to long-term interest development and is one of the key mechanisms by which personalized learning is thought to be effective (Bernacki et al., 2021).

Personalized learning can be applied in many different instructional contexts (e.g., formal/informal, in-person/online), and its features are evident in many different pedagogical approaches (e.g., project-based learning, universal design for

learning). However, personalized learning initiatives, such as tutoring programs, can be challenging to implement due to a variety of factors, including the cost and logistics of providing a well-trained tutor for students on an individual basis (Muñoz et al., 2008; Nickow et al., 2020). The use of educational technology is often seen as one way to keep costs down while ensuring scalable initiatives. In the present discussion, we focus primarily on technology-enabled personalized learning. Technology-enabled personalized learning refers to the design, adoption, and implementation of personalized learning strategies that leverage technology to support learning.

Effective pedagogical practices evident in technology-enabled personalized learning, which in many cases mimic human tutoring, include an emphasis on active student learning, use of sophisticated pedagogical strategies, inclusion of specific examples and cases, practice through collaborative problem solving and question answering, support for deep explanatory reasoning, convergence toward shared meanings, constructive feedback, and adaptation to students' affect in addition to error diagnosis and remediation (Graesser et al., 1995). Systems that promote technology-enabled personalized learning have been found to be as effective as human tutoring (VanLehn, 2011). Another advantage of technology-enabled personalized learning is that it can be integrated into a variety of classrooms and instructional formats, including in-class activities, homework, ungraded practice for students, or quick formative diagnostic assessments (Murphy et al., 2020; Pane et al., 2014). Thus, technology-enabled personalized learning could be integrated into teachers' lesson plans and classroom activities to provide individual, personalized support when needed but not replace the critical role that teachers and other instructional mentors play.

Most of the prior research on technology-enabled personalized learning has focused on personalizing instruction and providing adaptive support based primarily on cognitive or learning outcomes, including students' mastery of target knowledge and skills (see VanLehn, 2006). However, some research efforts to provide technology-enabled personalized learning attended to other aspects of the learning experience that facilitate knowledge acquisition, such as students' interests (see Walkington & Bernacki, 2018), emotions (D'Mello et al., 2011; Forbes-Riley & Litman, 2011), self-regulation (Dabbagh & Kitsantas, 2012), and social support via conversational agents (Gulz et al., 2011; Kumar et al., 2010). Some technology-enabled personalized learning systems that attended to both cognition and emotion have shown promise as students with lower prior knowledge were able to achieve proportional learning gains[1] comparable to those of their peers with higher prior knowledge. One such example is AutoTutor, an intelligent tutoring system designed to support students in learning topics related to Newtonian physics. AutoTutor uses natural language processing to model learners' cognitive and affective states and generate dialogue in a manner that adapts to these states (D'Mello et al., 2011). However, while existing personalized learning systems may consider social or emotional aspects of learning, the lens through which they are developed often assumes that these processes are universal and culture neutral (Roberts-Mahoney et al., 2016; Strekalova-Hughes et al., 2021). Past research has suggested that the way in which students purposefully engage with technology-enabled personalized learning systems may not generalize well across cultural contexts (Rodrigo et al., 2013). Expanding these technologies in ways that incorporate the cultural dimensions of a student's personal experience has the potential to greatly improve the relevance and impact of a personalized learning system (Donohue & Kelly, 2016).

Culturally Relevant, Responsive, and Sustaining Pedagogy

The notion that learning is a cultural process which is deeply embedded within social contexts has a long history in educational research and theory. According to Nasir et al. (2006), human development and learning can be viewed as the lifelong accumulation of various cultural practices that are interconnected, complementary, or often contradictory. Cultural practices may refer to the shared body of knowledge surrounding tools, customs, and social networks, mutually understood ways of organizing around joint activities, and generally, the various ways of understanding and engaging with natural and socially constructed phenomena (Nasir et al., 2006). According to the communities of practice framework, the process of learning goes beyond simply acquiring socially shared cognition and entails one's development of an identity as a member of a community who is knowledgeable and skillful in applying cultural practices (Lave, 1991; Wenger, 2009). Recognizing that culture is not static, the cultural–historical approach further emphasizes that such cultural practices do not define traits of individuals or groups of individuals but rather tendencies among people with shared histories (Gutiérrez & Rogoff, 2003).

Recognizing that learning is inherently a social and cultural process, several prominent educational theories have emerged describing pedagogical approaches that take into consideration the relevance of cultural practices in teaching and

learning. Prior research on culturally relevant (Ladson-Billings, 2009), responsive (Gay, 2018), and sustaining (Paris, 2012) pedagogy has identified key practices that enable educators to use the diversity of lived experiences and cultural backgrounds in the classroom to enhance the learning process and learning outcomes. Culturally relevant pedagogy refers to "an approach that empowers students intellectually, socially, emotionally, and politically by using cultural and historical referents to convey knowledge, to impart skills, and to change attitudes" (Ladson-Billings, 2009, p. 13). Adopting the core tenets of culturally relevant pedagogy can help students to develop the skills needed for success in and outside of the classroom (Ladson-Billings, 1995, 2021).

Culturally responsive teaching builds on the work of culturally relevant pedagogy and expands to further recognize the strengths of and support needed for students from historically marginalized groups. Culturally responsive pedagogy refers to the "use of cultural knowledge, prior experiences, frames of reference, and performance styles of ethnically diverse students to make learning encounters more relevant and effective. This pedagogy teaches to and through the strengths of these students. It is culturally validating and affirming" (Gay, 2018, p. 31). Gay (2002, 2018) explicated five features of culturally responsive pedagogy and associated teacher competencies: (a) developing a culturally diverse knowledge base; (b) designing culturally relevant curricula; (c) demonstrating cultural caring and building a learning community; (d) cross-cultural communications; and (e) cultural congruity in classroom instruction. Gay (2018) highlighted that for these teacher competencies to be developed and effectively used in the classroom, teachers will need more training and support. For example, to develop a culturally diverse knowledge base, teachers need to learn about the values, traditions, communication styles, and expectations shaping how children and adults interact with respect to different cultural and ethnic groups represented by their students. It is important to note that the development of these competencies is an ongoing process in which teachers continue to expand their knowledge base and improve their skills at utilizing their culturally diverse knowledge base to inform their instructional practices.

Lastly, culturally sustaining pedagogy builds on the valuable insights of both culturally relevant and responsive pedagogy. Culturally sustaining pedagogy refers to pedagogies that explicitly "perpetuate and foster—to sustain—linguistic, literate, and cultural pluralism as part of the democratic project of schooling" (Paris, 2012, p. 95). Sustaining the cultures of students includes, for example, focusing instruction on community languages, valued practices, and knowledges; enabling student and community agency; using content and instruction that incorporates students' histories and lived experiences; fostering students' capacity to contend with internalized oppression; and incorporating all these features in learning settings (Paris & Alim, 2018). Culturally sustaining pedagogy moves pedagogical practices from acknowledging or leveraging students' cultural identities toward also celebrating and perpetuating those cultural identities.

Although each of these areas of research has identified separate implications for pedagogical practices, a set of common practices can be identified (Stembridge, 2019):

- Focus on ensuring students' academic success and providing rigorous learning opportunities for students
- Leverage students' interests, culture, and community to support their learning
- Celebrate and value students' culture, diversity, and differences
- Center the creation of strong relationships between students, between students and teachers, and with the community
- Provide opportunities for risk-taking and promote vulnerability
- Confront inherent inequities in the educational system
- Support students in evaluating ways in which current social structures might contribute to inequities

Culturally Responsive Personalized Learning Framework

After reviewing literature on personalized learning and culturally relevant, responsive, and sustaining pedagogical practices, we then sought to synthesize the findings into a framework that can provide guidance for the design and development of technology-enabled CRPL. Our proposed framework includes six principles of CRPL: dynamic adaptation, support for student agency and choice, connection to lived experiences, consideration of social movement, shared power and respect, as well as opportunities for collaboration. The principles are organized into three broad dimensions, which include fostering flexible student-centered learning experiences, leveraging relevant content and practices to support individual

Table 1 CRPL Principles and Examples of Best Practices

Dimension	Principle	Example best practices
Fostering flexible student-centered learning experiences	Support for student agency and choice	Learning activity may afford students a choice to select from at least two response modalities, tasks, topics, or contexts. Teachers may also encourage students to exercise agency/choice, particularly when selecting from a range of tasks or responses to problems.
	Dynamic adaptation	Learning activity can be adapted to accommodate individual learners' past performances and interests, in addition to other context-relevant factors. Teachers may also respond in a dynamic and personalized manner to provide constructive feedback to students on an individual basis.
Leveraging relevant content and practices	Connection to Lived Experiences	Learning activity may provide examples based on concrete or familiar phenomena to support students in connecting to students' own experiences, particularly experiences likely to emerge from a cultural fund of knowledge. Learning activity provides a variety of culture-specific contexts and the teacher can select the subsets that are most relevant to their students.
		Teacher may facilitate connections to students' experiences by gauging students' interests and background knowledge.
	Consideration of social movements	Learning activity may provide opportunities for students to apply domain-relevant skills to identify problems or propose solutions to issues relevant to historical and cultural social movements oriented around justice. Teachers have adequate support and training to facilitate meaningful learning activities and discussions around these topics.
Supporting meaningful interactions within a community	Shared power and respect	Learning activities, curriculum, and other instructional decisions are developed and selected with appropriate input from school community stakeholders. Teachers and school leadership provide opportunities for school community stakeholders to provide input.
	Opportunities for collaboration	Learning activities can be designed around a variety of individual, paired, small group, whole-class, etc., activities and, where possible, provide some options for students to select their preferred format. Teachers facilitate meaningful interactions and encourage students to collaborate with peers they may otherwise have minimal interactions with.

students, and supporting meaningful interactions within a community. Table 1 provides an example of each of these principles. Each of these principles are defined in more detail in this section. We developed these principles to provide a framework and guidance for the future design and development of technology-enabled CRPL systems to support classroom teaching and learning.

Fostering Flexible Student-Centered Learning Experiences

Support for Student Agency and Choice

Support for student agency and choice is defined as providing opportunities for students to play an active role when engaging in a learning activity.

We consider two approaches to promoting agency: opportunities to exercise choice and the development of intrapersonal skills. Providing students with opportunities for meaningful choice in the learning process can increase feelings of agency and ultimately increase motivation (Cordova & Lepper, 1996; Ryan & Deci, 2000). Student agency may appear

within the context of a learning activity in numerous ways, and the extent to which an activity is open-ended – thus allowing for students to exercise greater agency in their learning experience and choice in selecting a response, task, or even a topic to learn about – may vary depending on a student's development and ability to self-regulate (Moses et al., 2020). One way in which this can be put into practice is through the selection of the next learning task. The learning activities that leverage CRPL could adopt a mixed-initiative approach in which a set of tasks are suggested to the student and allow the student to select their own next task (Bunt et al., 2007). The set of next tasks could reflect the same learning goal and difficulty level but with differing contexts to promote student agency without potentially diminishing the appropriateness of the learning content (Cordova & Lepper, 1996).

Providing students with opportunities to develop and apply their intrapersonal skills (e.g., self-regulated learning, emotional regulation, etc.) can facilitate feelings of control over their learning experience through empowering them to successfully manage their experience (Heckman & Kautz, 2012; Immordino-Yang, 2015). Experiencing systemic inequalities and negative stereotypes can diminish feelings of autonomy for students from historically marginalized or underserved communities (Lewis & Hunt, 2019). Although increased agency is beneficial for all students (e.g., Cordova & Lepper, 1996; Ryan & Deci, 2019), it may be particularly beneficial for students from marginalized groups.

Dynamic Adaptation

Dynamic adaptation is defined as providing a personalized, curated experience to students, either directly or via teacher or other mentor-supported interactions throughout the learning experience.

The benefits of providing a learning opportunity that adapts to the students at an individual level have been recognized for decades (e.g., Bloom, 1984). Various factors are likely to inform this process of adapting to students, including cognitive, motivational, affective, and cultural aspects of students and their context (Plass & Pawar, 2020). There are numerous ways that instruction or an instructional system may adapt dynamically to meet students' needs. For example, providing learning experiences that invoke immediate, specific, and constructive feedback to the student is thought to be highly effective in supporting student learning and many personalized learning systems are designed to provide such feedback efficiently (Spector et al., 2016). According to the theory of context personalization (Walkington & Bernacki, 2014), another method of dynamically adapting instruction involves placing learning tasks in the context of students' interests. Technologies that provide such personalized experiences can deliver scalable and dynamic learning opportunities for students (VanLehn, 2006). Leveraging students' cultural contexts (e.g., Gay, 2002; Ladson-Billings, 2009, 2014; Paris, 2012) through the use of personalized learning technologies may provide an even more flexible, tailored, and supportive environment that ultimately promotes engagement and learning.

Leveraging Relevant Content and Practices

Connection to Lived Experiences

Connection to lived experiences is defined as incorporating topics and/or contexts for learning materials that reflect and are aligned with the diverse lived experiences of students within and beyond the classroom.

Lived experiences refer to the accumulation of one's first-hand knowledge about the world gained through direct involvement in everyday events. Instruction that connects to students' lived experiences and "funds of knowledge" is contextualized, as opposed to decontextualized learning (Bruner, 1966). According to Vélez-Ibáñez and Greenberg (1992), the concept of funds of knowledge refers to knowledge and skills that emerge as a result of social and cultural interactions in a students' daily life. Contextualized learning has been promoted for over 100 years, as it helps to reduce the abstractness of concepts (Bruner, 1962, 1966; Dewey, 1913, 1938). However, it is important to go a step further and consider what contexts are being considered to support learning in classroom settings. Empirical research has demonstrated the promise of designing learning scaffolds that connect to students' lived experiences and value and sustain their cultural identities (Moll et al., 1992; Orosco, 2010; Requa et al., 2022). For example, young readers, including students from non-English-speaking (Requa et al., 2022) or low-income households (Neuman et al., 2021), may benefit from scaffolding of new vocabulary. Orosco (2010) found that direct and explicit instruction on new vocabulary, which connected to students' sociocultural knowledge — including their knowledge of the language primarily spoken at home — allowed students to

engage with a challenging text and could contribute to increasing students' reading achievement relative to the rest of the student population.

Consideration of Social Movements

Consideration of social movements is defined as incorporating topics and/or contexts for learning materials that reflect current and past social justice movements and other movements that promote equity.

Curriculum that promotes knowledge of historical and present-day social movements in a manner oriented toward social justice may better support students in connecting with content, in gaining respect for and awareness of the circumstances of others, and in challenging historical narratives that perpetuate racism (Picower, 2009, 2012). Through such a curriculum, students can explore social injustice, learn about social movements, and engage in promoting social justice, for example, by raising awareness of social injustices and becoming engaged in participatory citizenship. According to Gutiérrez et al. (1999), integrating such historical dimensions of students' lived experiences into learning activities is essential for leveraging students' collective knowledge of social, political, and historical events. According to Gutiérrez (2008), this shared knowledge, referred to as the "third space," is distinct yet overlaps with the home ("first space") and school ("second space") environments. Providing learning and assessment contexts that highlight social movements and tap into this collective knowledge may convey to students from marginalized groups that their culture and lived experiences are valued and celebrated (Montenegro & Jankowski, 2017; Randall, 2021).

Supporting Meaningful Interactions Within a Community

Shared Power and Respect

Shared power and respect is defined as including students, teachers, school leadership, and community partners in important decision-making processes that affect student learning and development, including, but not limited to, the development and selection of learning materials.

Shared power can help to achieve the goal of employing learning content that is contextualized in diverse cultures and lived experiences through the inclusion of diverse perspectives in the content development and selection process. A key distinction between the principle of *support for student agency and choice* and *shared power and respect* is that the former serves to primarily empower the student as an individual whereas the latter points to the empowerment of a system of stakeholders (e.g., student, teacher, parents/caregivers, school leadership, etc.). Because this principle emphasizes the importance of strengthening connections between school-based or other academic learning environments and the community and its culture practices, it is most closely connected with the foundations of culturally sustaining pedagogies (Paris, 2012; Paris & Alim, 2018). Engaging such community partners has the potential to leverage students' funds of knowledge and promote their learning experience by tapping into the rich information exchange students share with their family members and relationships outside of school-based settings (González et al., 2006). Seeking community input is one way to recognize such collective social and cultural knowledge and develop instruction and assessment practices that support student learning. For example, Kūkea Shultz and Englert (2021) provided a model for establishing validity evidence related to the content of the assessment, including the cultural contexts in which items or tasks are embedded. Toward establishing evidence of what the authors refer to as "cultural validity," Kūkea Shultz and Englert involved community members in the development of a statewide assessment program designed to preserve and revitalize the native Hawaiian language and culture. Particularly for younger students, practices that support shared power may also involve facilitating better communication between teachers, school leadership, parents, and other caregivers. For example, parents and caregivers who are in regular contact with educators may be better able to advocate for children with special needs, and teachers, in turn, can better understand parental positionalities and be more culturally aware (Connor & Cavendish, 2018).

Opportunities for Collaboration

Opportunities for collaboration is defined as encouraging students to work with their peers in partners or small groups. While the principles so far described have focused on students at an individual level, CRPL approaches also emphasize

relational aspects of learning, including relationships with classmate and other peers. As briefly mentioned previously, collaborative activities have been identified as essential for supporting the development of interpersonal skills. Interpersonal skills, also referred to as social skills, have been identified as critical for success in school and the workplace (Durlak et al., 2011; National Commission on Social, Emotional, and Academic Development, 2019). Facilitating collaborative activities also supports the development of cultural competence by encouraging students to share their own lived experiences with each other (Ladson-Billings, 2009). Providing students with a variety of tools and models for collaborative behavior can facilitate their development of effective peer communication and ways of working together to enhance each other's learning (Economides, 2008). For example, tools and models for collaborative behavior may support coregulated learning, which describes a state in which two or more individuals are actively and strategically controlling their learning experience (Allal, 2020). Key learning strategies that emerge during periods of coregulation include setting goals, planning, identifying problem-solving strategies, monitoring, reflecting, and evaluating (Zheng & Yu, 2016). For example, past work suggests that activities designed to support writing skill development can be enhanced through collaboration and coregulation (Allal, 2020).

Anticipated Impact of CRPL on Learning and Development

Although CRPL lacks an existing unified framework, our definition draws on reviews of research on related topics. We anticipate that incorporating CRPL practices in classroom settings will lead to several outcomes. By incorporating CRPL into instruction, teachers can work toward creating environments that support academic engagement and achievement. Academic engagement is critical for learning to occur: If students are not engaged with the learning experience, then the pedagogical strategies that focus on other aspects of learning are unable to be effective (Fredricks et al., 2004). Incorporating CRPL practices into instruction is likely to lead to greater interest in activities through connection to students' own lives and other meaningful contexts (Gay, 2018). In addition, instruction that emphasizes CRPL practices is likely to increase motivation and feelings of ownership over learning activities through incorporating instructional practices that support student agency and shared power among school community stakeholders (Ryan & Deci, 2019). Furthermore, because CRPL practices are responsive to the strengths, needs, and interests of the student, they are likely to support student success (Ladson-Billings, 2009).

In addition to academic engagement and learning, we anticipate that the inclusion of CRPL practices will also have an impact on the development of students' social and emotional competencies. Although the term *social and emotional learning* (SEL) has been defined in a variety of ways, we apply the definition developed by the Collaborative for Academic, Social, and Emotional Learning (CASEL):

> the process through which all young people and adults acquire and apply the knowledge, skills, and attitudes to develop healthy identities, manage emotions and achieve personal and collective goals, feel and show empathy for others, establish and maintain supportive relationships, and make responsible and caring decisions. (2022, para. 1)

K–12 schools across the United States are increasingly emphasizing SEL along with academic achievement (Atwell & Bridgeland, 2019; Bryant et al., 2020; Hamilton & Doss, 2020), though recent politicization of SEL at the state and local levels has created challenges for educators who are interested in supporting SEL (Tyner, 2021).

Competencies associated with SEL (e.g., social awareness, self-management, responsible decision-making) have broad applicability to how students engage with tasks and with each other. Two propositions have gained broad acceptance and are bolstered by rigorous evidence on SEL, which is relevant to the definition of CRPL previously mentioned. The first proposition is that all academic learning is inherently social and emotional (Allensworth et al., 2018; Aspen Institute, 2019). As such, students bring their social contexts and emotional states into the learning environment and these qualities are intertwined with academic learning. This integration of social contexts, emotional states, and academic learning is important to consider within instructional contexts designed to support the needs of individual students (Steiner et al., 2020). The second proposition, the development of students' SEL skills necessitates responding to their social and cultural contexts, is a key element of an approach that Jagers et al. (2019) have called "transformative SEL." Some have critiqued existing efforts to implement SEL instruction, pointing out that past efforts have not adequately considered cultural variation in the development of SEL skillsets (Simmons, 2019). In this regard, CRPL practices are likely to

provide contexts for learning that not only are highly engaging but also support the development of a range of SEL skills (Durlak et al., 2011).

Discussion and Implications

These six principles of CRPL provide a framework that reflects past research and theory on personalized learning and culturally relevant, responsive, and sustaining pedagogical practices. Such a framework could provide a starting point for the development of scalable personalized learning systems that can appropriately respond to students' learning needs based on a variety of factors, including the student's cultural context. Although there is a large body of existing literature on approaches emphasizing personalized learning and culturally responsive, relevant, and sustaining pedagogies, the framework presented here is novel because it offers an integrative perspective that emphasizes support for the individual student within diverse contexts. By assuming this integrated perspective, we hope this framework provides some guidance for supplementing—rather than replacing—practices aligned with existing approaches. Our proposed CRPL framework is informed by research, but there is a need for empirical research to support widespread adoption of CRPL. Nonetheless, this early work suggests implications for future research, policy, and practice. First, it will be crucial for researchers and educators to evaluate how the CRPL framework can be most effectively implemented in practice and to assess its impact on promoting students' learning. This type of investigation will allow for refinement of the framework by identifying what principles or mechanisms need to be further developed or reconsidered to be more effective in supporting students. Another critical aspect of any future investigation into this topic is to determine how best to support teachers in evaluating, designing, or implementing learning tasks that leverage CRPL to the benefit of students (e.g., through professional development, technology features). Incorporating CRPL principles into the classroom may be more attainable using technology, though the practicalities of this need to be further explored. In the same way that many technology-enabled personalized learning systems leverage the best practices of expert human tutors, technology-enabled CRPL should leverage the best practices of teachers who are able to effectively use culturally relevant, responsive, and sustaining pedagogical practices.

The knowledge generated from current and future research on CRPL, and its implementation, could eventually have implications for education policy. Across the United States, all 50 states have adopted teaching standards to support culturally responsive teaching practices (Muñiz, 2019). Similarly, many educators appear to be aware of and work toward personalizing instruction (Pane et al., 2017). There is presently an opportunity to teachers and school or district leaders to build on the synergies of these recognized best practices. Technologies based on the principles of this CRPL framework could both facilitate teachers' use of culturally responsive pedagogical practices in the classroom and provide the basis toward a deeper understanding of how such practices can be implemented to further support students. A better understanding of how CRPL impacts learning outcomes could promote more informed policy decisions built around culturally relevant, responsive, and sustaining pedagogical practices more generally.

One obvious challenge to implementing CRPL practices is that it will be difficult for any technology-driven model of student identity to accurately account for the ways in which students' identities exist at the intersection of multiple cultural groups, which could fluctuate and evolve across time. Implementing CRPL practices thus necessitates a highly student-centered approach to personalization in order to flexibly adapt to such intersectionality. Involving students, teachers, school leadership, parents/caregivers, and other community stakeholders in discussions around the benefits and limitations of CRPL that uses such technology is essential (Holmes et al., 2021). Input from such stakeholders may help to identify instances where curating learning experiences runs the risk of perpetuating societal inequities (Yang et al., 2021). Another way to approach these issues involves collaboratively developing analytic models of student learning that are appropriately transparent in conveying how data are collected and reported.

Many teachers are already tasked with providing culturally responsive and/or personalized learning to the students in their classrooms (Muñiz, 2019). An effort to incorporate CRPL through the use of technology could have the added benefit of providing teachers with training, support, and resources to implement CRPL and culturally relevant, responsive, and sustaining pedagogical practices more widely. Feedback provided about student interactions with technology-enabled platforms could further support the use of culturally relevant, responsive, and sustaining pedagogical practices that facilitate student engagement and learning. Technology that leverages CRPL principles could, for example, highlight the topics that students prefer or the ways in which students interact with different activities to provide

actionable insights for teachers to adapt their future instructional practices to meet the needs of the students in their classrooms.

How CRPL principles are adopted requires an understanding and appreciation of the cultures and needs of school communities. Given that such communities are inherently different from one district and school to the next, the ways in which these practices are adopted will vary, which means that there ultimately needs to be a flexible framework to guide their application to best serve each community and all students. Though it remains to be determined how CRPL may best be integrated into teachers' instructional practices, these principles provide a framework for designing and developing technology-enabled systems that can support the implementation of CRPL practices into the classroom.

Note

1 Proportional learning gains reflect the degree of improvement on a posttest measure, above and beyond pretest performance (D'Mello et al., 2011).

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