

## The Implementation of Personalized Learning in a Rural School District: A Case Study

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*In this qualitative case study, we explored student and teachers' experiences with the implementation of personalized learning in a rural Kentucky school district. Students revealed differences among teachers implementing personalized learning. Student engagement depended on their teachers' willingness to adapt their instruction and learning environments for personalized learning. Teachers noted the need to release some of the control they have traditionally had and turn those responsibilities, to a degree, over to students. We also identified a need for teachers to have more training and support while transitioning to personalized learning; not only challenging them to change their mindset, but also on the level of work required in lesson planning and monitoring student progress in personalized learning. The implementation of personalized learning requires a collaborative process in which all stakeholders have an opportunity to understand the complexity of the personalized learning framework and what it needs for implementation. This requires working to develop a consistent definition of the personalized learning model implemented so that training, resources, and support can be determined prior to implementation.*

*Key Words: Rural Schools, District Reform, Personalized Learning*

### Introduction

Schools and districts throughout the United States are increasingly turning to personalized learning as a way to meet the diverse interests, needs, abilities, and aspirations of their students, perceiving it as a promising means of raising academic achievement (Bingham et al., 2016; Sykes et al., 2014). Unlike traditional education, which one may characterize as a *one-size-fits all* approach with students navigating through the same curriculum and activities at the same level and pace, personalized learning is student-centered and seeks to increase students' opportunities to drive their own learning, increase student engagement, close achievement gaps, and prepare students to become lifelong, self-directed learners (Patrick et al., 2013). Personalized learning provides standards-based and project-based differentiated instruction as well as student agency, on-demand instructional supports, flexible pacing, individual student profiles, frequent feedback, opportunities for deeper learning, and flexibility in location. The latter emerged as a particularly important characteristic in meeting the challenges posed by the COVID-19 pandemic. Instructional practices include personalized learning plans, project-based learning,

competency-based assessments, and integrating data-driven learning technologies (e.g., Kallio & Halverson, 2020; Nandigam et al., 2014; Netcoh, 2017).

Within the extant literature, there is a lack of research on student perspectives, perceptions, engagement, and experiences with personalized learning (Fielding, 2006; Netcoh, 2017). Netcoh (2017) states that, “additional research should be conducted on the provision of choice within personalized learning environments to further investigate the complexities, challenges, and opportunities associated with this practice” (p. 391). Researchers also reveal a lack of understanding among teachers as to what personalized learning is and how to implement it in the classroom (Courcier, 2007; Waldeck 2006). Research that explores key stakeholders’ perceptions of the implementation of personalized learning may inform future implementation efforts, identifying potential pitfalls and lessons learned (Pane et al., 2015; Wolf, 2010). In response to these calls for future research, we explored students’ and teachers’ experiences with the implementation of personalized learning in a rural Kentucky school district. Rural districts, like our case study district, serve students who are less likely to attend a postsecondary institution, and if they do, are less likely to attend highly selective institutions and institutions that conduct research and confer graduate degrees (Koricich et al., 2018).

### Review of the Literature

Personalized learning has become more prevalent as a response to globalization and challenges to the industrial mass production model of education that has predominated (Cuban, 2018; Peters, 2009). Educational practices have begun to shift due to innovative changes in the technological industry (Basham et al., 2016; Kallio & Halverson, 2020). Other contributing factors to this shift are federal policies and financial support (e.g., Race to the Top), support from private foundations (e.g., Bill and Melinda Gates Foundation), and the work of education service providers, such as Edutopia (Bingham et al., 2018). Furthermore, there is now increased accessibility of online and blended education options in K-12 education (Barbour, 2009, 2015; Molnar et al., 2021; Watson, 2008).

Although its use has expanded, there is no one, all-encompassing definition for personalized learning; many of which emerged outside the United States (Zmuda et al., 2015). David Miliband, former Secretary of State for Education and Skills in the United Kingdom, penned one of the earliest definitions, stating:

This is what I mean by “Personalised Learning”. High expectations of every child, given practical form by high quality teaching based on a sound knowledge and understanding of each child’s needs. It is not individualized learning where pupils sit alone at a computer. Nor is it pupils left to their own devices – which too often reinforces low aspirations. It can only be developed school by school. It cannot be imposed from above. (2004, p. 8)

Sebba et al. (2007) describe personalized learning as “tailoring education to individual need, interest and aptitude so as to ensure that every pupil achieves and reaches the highest standards possible, notwithstanding their background or circumstances, and right across the spectrum of achievement” (p. 15). Maguire et al. (2013) defined personalized learning as a way of learning that provides flexibility for students and teachers in how teaching and learning occurs. Murphy et

al. (2017) state that, “Personalized learning varies the time, place, and pace of learning for each student, enlists the student in the creation of learning pathways, and utilizes technology to manage and document the learning process and access rich sources of information” (p. 3).

Acknowledging the diversity of definitions and operationalizations of personalized learning, scholars have drawn distinctions between personalized learning and other strategies, such as differentiation and individualization, particularly in terms of the locus of control. With differentiation and individualization, the locus of control is with the teachers who differentiate and individualize for the students, whereas with personalized learning, the locus of control is with the student (Bray & McClaskey, 2015; Clarke, 2013; Netcoh, 2017).

The distinctive features of personalized learning continue to be vague and debated (Prain et al., 2012). Sebba et al. (2007) assert that personalized learning comprises five key components: assessment for learning, effective teaching and learning, curriculum entitlement and choice, school organization, and the provision of opportunities to learn beyond the classroom. Pane et al. (2017) identify four essential components of most personalized learning models. Those components are learner profiles, personal learning paths, mastery, and flexible learning environments. Learner profiles are developed, revisited, and revised based on student strengths, weakness, goals, and interests. Personal learning paths develop in response to the needs, goals, motivation, and progress of the student. Evidence of mastery comes from either competency-based assessment or continual assessment of students to demonstrate mastery of their defined goals. Finally, flexible learning environments allow for meeting student needs through flexible access to teachers and use of time and space. While many educators understand how personalized learning seeks to transform teaching and learning, its design and implementation in the classroom remains elusive (Patrick et al., 2013). Indeed, due to the lack of a consistent definition as a school model and its being a relatively new phenomenon, there is little peer-reviewed research on personalized learning as a whole school model (Bingham et al., 2018).

In her examination of personalized learning on postsecondary campuses, Waldeck (2006) noted the emergence of common themes in the characterization of personalized education initiatives at colleges and universities. These include faculty/student relationships, small class sizes, personalized education plans, and collaborative learning arrangements. Although Waldeck (2006) focuses on personalized learning on postsecondary campuses, it evinces similar problems one would see in K-12 school settings, as there is great latitude in how each school implements personalized learning due to the many ways in which educators define personalized learning. To that end, Courcier (2007) examined teachers’ perceptions of personalized learning in a study undertaken in the United Kingdom. While believing the concept of personalized learning is worthwhile, the teachers reported it as hard to implement within the classroom. Courcier concluded that implementing personalized learning without a complete understanding of what it is mitigates its effectiveness. For students to find success and develop into independent learners, teachers must have a clear understanding of personalized learning and its implementation.

Deed et al. (2014) found that the shared understanding of the teacher and students produced teacher and student expectations and perceptions of their own and each other’s choices and actions. There is a balance needed between teacher and student responsibility for student learning. The personalized environment allows for both student and teacher agency.

Implementing personalized learning and promoting student agency requires that teachers shift their behaviors from controlling the lesson to facilitating the lesson.

While accommodating various learning styles are vital to personalizing the learning path of each student, the absence of appropriate pedagogical strategies places a limit on the effectiveness of teaching and learning (O’Keeffe et al., 2006). Mitigating this risk depends on building a personalized path that focuses on knowledge domains consisting of concepts with consideration of student and teacher preferences. Neither the teacher nor the student is likely to arrive at this end without some assistance from technology. Basham et al. (2016) affirms that more than technology is required in personalized learning environments. The more important aspects of personalized learning are highly, self-regulated learners, as well as transparent and actionable real-time data. Technology in and of itself is just the tool for implementation unless it provides the means for access to real time data. Pane et al. (2015) identified the use of data as a key strategy for student learning success in personalized learning. Teachers having access to real time data, analyzing that data, meeting one-on-one with students to set specific learning goals, and helping the student create the path to mastering those goals is a break from the traditional one-size-fits-all model of education.

Drawing upon distributed leadership theory, Kallio and Halverson (2020) identified three key tasks that educational leaders need to redesign organizational routines and support the implementation of personalized learning. These are reorganizing learning environments to support student voice and choice; assembling an idiosyncratic technology ecosystem to distribute teaching and learning tasks; and redesigning instructional time to prioritize student’s interests, agency, and learning relationships.

Scholars of personalized learning have called for further research on student perspectives, perceptions, engagement, and experiences with personalized learning and the provision of choice in schools that have adopted it as an instructional strategy (Fielding, 2006; Netcoh, 2017). Researchers also call for research that explores stakeholders’ (e.g., teachers) perceptions of personalized learning implementation in order to inform future implementation efforts (Pane et al., 2015; Wolf, 2010). Responding to these calls for further research, we sought to answer two research questions:

- What are students’ perceptions of personalized learning and its implementation in a rural school district?
- What are teachers’ perceptions of personalized learning and its implementation in a rural school district?

### **Methods**

We will now discuss our methods used to explore students’ and teachers’ perceptions of personalized learning in a rural school district. We utilized a qualitative case study, specifically, a bounded single case holistic research design (Yin, 2018). We first discuss the context of our study. We then delineate our various data sources and the analysis of these data.

## Context of the Study

The context of our study is the Trimble County School District (TCSD), a rural Kentucky school district that serves approximately 1,100 students. TCSD has experienced declining enrollments and has limited diversity among its student racial demographics (See Table 1). The middle school and high school consolidated due to the declining enrollments, becoming Trimble County Junior/Senior High School in the 2018-2019 school year.

**Table 1.** Demographics, Trimble County Junior/Senior High School (2018-2019)

Demographic	N	%
White	499	94.9
African-American	3	.5
Hispanic	13	2.5
Asian	3	.5
Native American	1	.2
Hawaiian/Pacific Islander	2	.3
Multiracial	5	.9
Male	272	51.7
Female	254	48.3
Free/Reduced Lunch	292	55.5
ELL	5	.9
ECE	46	8.7
Gifted	114	21.6

Although Trimble County Junior/Senior High School emerged from persistently low-performing accountability (PLA) status at the beginning of the 2016-2017 school year and both graduation rates and overall test scores improved, students still underperformed in the state's reading, math, and overall college readiness measures. During the 2017-2018 accountability cycle, the Kentucky Department of Education identified the middle school as a targeted support and improvement (TSI) school due to poor standardized test scores of students receiving free/reduced meals. School report card data and past performance on state student assessments suggest that instructional practices prior to implementing personalized learning was not meeting the needs of its students. Accountability outcomes since exiting TSI status have been stagnant (See Table 2). As a result, TCSD leaders at the school- and district-level engaged in a collaborative process to redesign the way its schools structure and deliver curriculum and instruction with the goal of reimagining and personalizing learning through student agency and meeting accountability targets.

At the time of our study, TCSD was in its third year of implementation. The district utilizes the Summit Learning Platform for all core content classes (English language arts, math, science, and history). Summit components include self-paced, mastery learning of focus areas, performance-based assessment through project-based learning, and goal setting. Developed in 2004, the

**Table 2.** School Performance Indicators, 2016-2019

Academic Year	Grade Levels	Content Area	Novice	Apprentice	Proficient	Distinguished	Proficient/ Distinguished
2016-2017	7-8	Reading	26.4	21.8	36.3	15.5	51.8
		Mathematics	30.6	42.5	20.2	6.7	26.9
		Science	-	-	-	-	-
		Social Studies	14	32.3	37.6	16.1	53.8
		Writing	15.1	40.9	34.4	9.7	44.1
	9-12	Reading	41.7	9.3	40.7	8.3	49.1
		Mathematics	31.8	35.3	27.1	5.9	32.9
		Science	34.7	45.3	20	0	20
		Writing	22.4	32.9	38.2	6.6	44.7
		2017-2018	7-8	Reading	26.0	21.9	35.4
Mathematics	24.0			48.6	21.2	6.3	27.4
Science	18.0			62.0	18.0	2.0	20.0
Social Studies	16.7			30.2	44.8	8.3	53.1
Writing	12.5			49.0	33.3	5.2	38.5
9-12	Reading		31.7	23.2	31.7	13.4	45.1
	Mathematics		28.6	39.3	32.1	0.0	32.1
	Science		28.0	52.4	18.3	1.2	19.5
	Writing		18.1	36.1	36.1	9.6	45.8
	2018-2019		7-8	Reading	25.3	22.1	35.8
Mathematics		24.7		49.5	21.1	4.7	25.8
Science		30.4		47.8	21.7	0	21.7
Social Studies		12.2		44.9	35.7	7.1	42.9
Writing		26.5		53.1	15.3	5.1	20.4
9-12		Reading	30.3	23.7	34.2	11.8	46.1
		Mathematics	38.7	30.7	30.7	0	30.7
		Science	31.1	45.9	23	0	23
		Writing	18.9	47.3	27	6.8	33.8

Summit Learning Platform offers schools and districts a customizable, standards-aligned curriculum for grades 4 through 12 in core subjects, including customizable hands-on projects, teaching and learning resources, and assessments (Summit Learning, n.d.). The embedded student dashboard provides teachers the opportunity to offer specific real time feedback and insight into student understanding that enables teachers to meet students where they are on a given skill/standard.

There are four core competencies embedded within each course: cognitive skills (interdisciplinary competencies-how we use what we know), content knowledge (common core standards), habits of success, and sense of purpose (long-term goals). The district monitors student achievement through mastery of focus areas and performance based assessment projects

within each unit of study. Through the evaluation of Performance Based Assessments (PBAs), students are provided feedback based on a rubric that includes 36 cognitive skills across all grade levels. For each skill, a student must score 6 on a scale of 0-8 in order to demonstrate college and career readiness. Student progress is a continuum of competency in a skill appropriate for their developmental level of growth. Grades are on a rolling basis and not final until the course is completed and mastery achieved. Google classroom and Edgenuity are additional tools utilized in electives, Career and Technical Education (CTE) pathways, and other required courses to personalize learning. All teachers implementing personalized learning are expected to offer students voice and choice in their pace, path, and/or product to demonstrate mastery of a skill or standard.

**Data Sources**

We drew from a number of data sources in our study. These include school climate surveys of teachers and students, student interview data, documents (school and district), and Group Level Assessment (GLA) data with teachers from across the district<sup>1</sup>. Survey data were collected from students and teachers via the Climate and Culture Middle and High School Student Survey and the Climate and Culture Middle and High School Teacher Survey, consisting of 20 items categorized into three domains of engagement: behavioral, cognitive and emotional (Fredricks et al., 2004).

**Table 3.** Comparison of District Secondary Students and Student Participants

	Grade level	Gender	Free/Reduced Lunch status	Special Education	Racial Diversity
General Population	07-17%	M-52%	55%	13%	95% White (non-Hispanic)
	08-19%	F-48%			
	09-20%				
	10-16%				2.9% Hispanic or Latino
	11-14%				
	12-14%				0.8% 2 or more races
					1.3% Other
Student Sample	07-17%	M-50%	42%	8%	100% White (non-Hispanic)
	08-17%	F-50%			
	09-25%				
	10-17%				
	11-17%				
	12-08%				

We conducted semi-structured interviews with a purposive sample of twelve students from across grades 7 through 12 in their second or third year of experience with personalized learning,

<sup>1</sup> Given page limitations, we did not include the surveys, student interview protocol, and GLA protocol in the manuscript, but these are available from the authors upon request.

seeking to ensure diverse representation by gender, socio-economic status, and students identified with disabilities (See Table 3). Regrettably, we were unable to ensure racial diversity due in part to the lack of diversity in the district, but also because none of the non-White students agreed to participate (See Table 4).

**Table 4.** Demographics of Individual Students Participants

Student Identifier	Grade	Gender	Lunch status	Special Education	Racial Diversity
AT	7	F	F/R	No	White
GG	7	M	N/A	No	White
CT	8	M	N/A	No	White
JL	8	M	R	No	White
LM	9	M	N/A	Yes	White
AB	9	F	F/R	No	White
PH	9	F	F/R	No	White
MB	10	F	N/A	No	White
CV	10	F	N/A	No	White
MK	11	F	N/A	No	White
PW	11	M	N/A	No	White
RW	12	M	F/R	No	White

Notes: F = Female; M = Male; F/R = Free/Reduced Meals Recipient; R = Reduced Meals Recipient; N/A = Not Applicable.

In terms of teacher participants, we undertook a group level assessment (GLA) with teachers from across the district who agreed to participate. GLAs are an approach grounded in participatory action research that allows equal opportunity for participants to have input and voice in the generation of data, evaluation of the data, and action planning (Graham et al., 2015; Vaughn, 2014). GLAs serve as an alternative to conventional methods of interviews and focus groups, generating engaging qualitative research data (Reddy, 1996; Vaughn & Lohmueller, 1998). We invited a purposive sample of teachers in grades 5-12 having: a.) experience in both the traditional model of education as well as personalized learning; and b.) a wide range of teaching experiences and education attainment levels. In total, 8 out of 16 teachers agreed to participate in the group level assessment, representing a 50 percent participation rate (See Table 5).

We analyzed school and district documents also in order to identify the policies and practices set forth by the district regarding the implementation of personalized learning. These include documents from the school's Site Based Decision Making Council (SBDM), school board meeting agendas and minutes, district strategic plans, and the district's Learning Centered Anchor Chart.

### Data Analysis

We conducted a qualitative grounded theory research design, an iterative, comparative, interactive, and adductive method that allows one to go back and forth between data collection and data analysis, developing a theory grounded in the data (Charmaz, 2008; Creswell & Poth,



**Table 5.** Demographics of GLA Teacher Participants

Teacher ID	Gender	Teaching Level	Years in Teaching	Years in Personalized learning	Education Attainment
1	F	E	16-20	2	Master's
2	F	M	11-15	2	Bachelor's
3	F	E	6-10	3	Master's
4	F	E	11-15	3	Master's +
5	F	E	6-10	2	Bachelor's
6	F	H	16-20	2	Master's
7	M	H	1-5	2	Bachelor's
8	M	M	16-20	3	Master's
n = 8	M-25% F-75%	E -50% M – 25% H – 25%	1-5 years-12.5% 6-10 years-25.0% 11-15 years-25.0% 16-20 years-37.5%	2 years-62.5% 3 years-37.5%	Bachelor-50.0% Masters-37.5% Masters +-12.5%

Notes: F = Female; M = Male; E= Elementary; M= Middle School; H=High School

2018; Glaser & Strauss, 1967). We utilized simple descriptive analysis of our climate and culture survey data. As this is a case study of students’ and teachers’ perceptions of their experiences within personalized learning, documents served as a means of triangulating data from other sources (survey data, student interview data, and teacher GLA data). Drawing upon both students’ and teachers’ perspectives provided another means of triangulation.

### Findings

We structured our findings by first discussing climate survey data collected from students and teachers in order to provide additional contextual analysis. We then discuss students’ perceptions of personalized learning and its implementation, drawing upon student interview data. Finally, we discuss teachers’ perceptions of personalized learning and its implementation, drawing upon Group Level Assessment data with teachers from across the district. References to district and school documents data were interspersed within our discussion of findings.

### Survey Data

Student data from the Climate and Culture Middle and High School Student Survey 2018-2019 and 2019-2020 provide an overall view of student perceptions of their experiences. In total, 361 of 525 students (69%) responded to the survey in 2018-2019; and 169 of 530 of students (32%) responded to the survey in 2019-2020.

We identified the top four student responses to each question as indicated in Table 6. Students indicated feeling *pressured, rushed, tense, tired, challenged, and confused*. These most frequently selected descriptors suggest that students were grappling with having greater

responsibility under personalized learning. Students pointed out that they most often engage in such tasks as taking tests, working alone, listening to teachers, and thinking. While direct instruction by teachers serves as part of the implementation of personalized learning, three out of the four top student responses show student actions and initiative, as opposed to teacher-directed activities.

**Table 6.** Top Four Responses from Student Surveys

Which four of the following words or phrases best describes...	Jr/Sr High School 2018-19	Jr/Sr High School 2019-20
The expectations for you as a student?	I am learning-63 I should ask a teacher-52 I understand-49 I am expected to be good at some things-43	I am learning-55 I should ask a teacher-53 I am expected to be good at some things-52 I am busy-44
The things your teachers say to you while at school?	Explain it-54 You will be working on-55 We will be working on-52 What are you doing-38	Explain it-58 We will be working on-50 You will be working on-50 What are you doing-50
How you feel when trying to complete your assignments while at school?	Pressured-54 Rushed-53 Tense-48 Hurried-46	Pressured-62 Rushed-55 Never enough time-49 Tense-47
What you think of your teachers?	Honest-53 Caring-53 Fun-36 Interesting-31	Honest-49 Caring-46 Fun-35 Active-31
The things you most often do while in class?	Take tests-61 Work alone-49 Listen to teachers-45 Think-39	Take tests-58 Works alone-54 Listen to teachers-52 Think-40
The interactions you have with adults at your school?	Respectful-61 Helpful-49 Supportive-46 Trusting-46	Respectful-56 Brief-50 Helpful-44 Supportive-40
How you feel while at school	Bored-56 Tired-55 Confused-46 Challenged-35	Tired-64 Bored-60 Pressured-48 Challenged-44
The physical space in which you spend most of your time at school?	Plain-51 Stressful-49 Comfortable-45 Chaotic-38	Stressful-63 Plain-49 Chaotic-49 Comfortable-34

Students indicated through their word choices, that their teachers are *honest*, *caring*, *fun*, and *active*. They chose the words *respectful*, *helpful* and *supportive* to acknowledge their interactions with adults in their school. They also identified the following phrases their teachers use as most prevalent: *explain it*, *what are you doing*, *you will be working on*, and *we will be working on*. Less than 20% of students chose phrases that were directive or judgement in nature. Student word selections suggest they perceive a classroom environment that actively involves students and that teachers in general have built a positive community of learners.

**Table 7.** Teacher Climate/Culture Survey Most Frequent Responses

Which four of the following words or phrases best describes...	2018-19 N = 26 (87%)	2019-20 N = 25 (83%)
The expectations for students at your school?	Students are learning-88% Students are able to explain-83% Students understand-58% Students are expected to be good at some things-54%	Students are learning-76% Students are able to explain-60% Students understand-52% Students are expected to be good at some things-40% Students should find it themselves-40% Students should ask a teacher-40%
What are the kinds of things you say to your students?	We will be working on-79% Explain it-71% What are you thinking-50% You got it right-33%	We will be working on-72% Explain it-52% What are you thinking-48% I am interested in your thinking-36% I am interested in your answer-36%
How you feel when trying to complete your responsibilities at work?	Never enough time-71% Hectic-54% Pressured-54% Deliberate-46% Tense-38%	Never enough time-56% Pressured-56% Hectic-44% Patient-44% Calm-40% Tense-36%
What you think of your colleagues, in general?	Caring-88% Real-33% Active-54% Interesting-29%	Caring-84% Honst-60% Real-44% Interesting-40%
What students most often do in your classroom?	Challenging work-54% Classroom work-46% Long projects-46% Work with others-42% Think-33% Tests-33%	Classroom work-60% Think-48% Challenging work-40% Write-36%
What are the interactions you have with other teachers at your school?	Supportive-83% Respectful-75% Collaborative-67% Helpful-54%	Supportive-92% Respectful-84% Helpful-60% Trusting-52%
The physical spaces in which you spend most of your time at school?	Comfortable-75% Stable-67% Inviting-58% Open-46%	Comfortable-64% Flexible-44% Inviting-40% Open-36% Bright-36% Plain-36%
How you feel while at work?	Challenged-71% Tired-63% Pressured-54% Interested-42%	Challenged-52% Pressured-52% Tired-48% Interested-40% Happy-40% Supported-40% Encouraged-28%

With regard to teacher survey data (See Table 7), the response regarding student expectations that appeared most frequently was *students are learning*. The percentage decreased over time, but it remained as the top response in both 2018-19 and 2019-20. *Students are able to explain* was the second most frequent response. The other response that appeared most frequently was *students understand*. When responding to what teachers generally say to students, the three responses that appeared most frequently were, *we will be working on*, *explain it*, and *what are you thinking?*

When responding to how they feel when completing responsibilities at work, teachers consistently listed *never enough time* as the most frequent answer, with *hectic* and *pressured* showing up most frequently as either the second or third most frequent response. The only other response that was consistent was *tense*. When responding to how teachers felt at work, teachers listed *challenged* as the most frequent response with *tired* and *pressured* as the second and third most common responses. These responses suggest what teachers would likely feel during a time when making drastic changes in instruction and implementing a new model of teaching and learning. Analysis of the responses from the group level assessment provide deeper data needed to explore this possibility.

### **Student Perceptions of Personalized Learning Implementation**

In this portion of our paper, we first discuss student perceptions of personalized learning generally as well as their role in personalized learning. We then discuss the students' perceptions of the role of the teacher and their peers in Personalized Learning, respectively.

#### ***Perceptions of Personalized Learning and Their Role in Their Own Learning***

Analysis of the district strategic plan identified achieving excellence in academics as the district's first priority, stating:

Students who earn a diploma from Trimble County Schools will be: self-motivated, resilient and persevere through challenges, confident, innovative problem solvers, critical thinkers, effective communicators, goal-driven, leaders who are ready for post-secondary education/careers, and service-oriented citizens.

Individual student interviews revealed their appreciation of having student agency—learning through activities that are meaningful, relevant to learners, driven by their interests, and often self-initiated with guidance from teachers. AT stated, “I love school [and] love Summit because I am independent, and like to do it myself.” RW offered that he became a better student during his four years at his school, explaining, “I have deadlines but could work at my own pace, which helped a lot to get things done.” LM shared “I learn better if it is something I am interested in. I am better to work on my own...Each year has gotten better because I figured out I could get ahead. It is a good improvement.” MB stated, “I am a really fast learner, so a lot of the things come easy. I enjoy the program because I can work at my pace, which is fast.” GG said, “Most of the days I worked on FA [focus area] were workshop days. I like those days a lot. I could get more FA done. Most of it was work on your own.”

The commonalities among these statements are shared sentiments regarding the ability to have choice in pace and path through personalized learning. A few students also spoke to the relevancy piece of agency. JL replied, “I like history because I have always been interested in it as long as I can remember. Best grade I have.” LM shared, “I work on the farm and I am a hard worker. I think if I don’t see the relevance, I have a harder time.”

However, not all students expressed that this shift in agency was an easy one. CV spoke about the transition, stating:

I am more of a hands-on learner. It has been harder with Summit because it is not as hands on as I was used to. I started it in my 8th grade year. That was hard because nobody knew how it worked.

JL noted that, “It was easier before [personalized learning] because there was more structured time.” AB described her experience with personalized learning as “more of a self-taught thing”, describing it in negative terms as “Pretty much on a computer the whole time. Some teachers do not even speak to you.”

Students revealed the importance of self-efficacy in reaching the level of agency associated with their experiences as students. PH stated, “I am a mix of learning styles. It depends on the subject. In English, I need to write or highlight.” She reveals an awareness of her needs as a learner and of being able to deal with a particular task. In the same manner, JL revealed his understanding of himself as a learner, stating, “I learn better when I read”. PW acknowledged his learning style in relation to his experience as a learner stating, “Using my hands is how I learn best...just using my hands. I also watch and listen, but pair it with another strategy.” The students revealed an understanding of whom they are as learners, what works for them, and a sense of their abilities to tackle a task in order to develop agency and meet learning outcomes.

Likewise, students need to develop the capacity to self-direct the learning process in order to reach a level of agency that empowers them (Kallick & Zmuda, 2016). The concept of self-direction appeared nine times across student responses. LM described the process that led to self-directed learning in that there was a release of responsibility: “During personalized learning time, the teacher announces group help time and calls small groups over or individually. The rest of the class is working independently.” CT echoed this with her statement: “I take notes from resources on playlists or work on focus areas or projects.”

Describing their role in personalized learning, AT shared, “Teachers gave samples, but I did it my own way.” AB discussed her confidence in her decisions about learning, stating, “I personally prefer reading; not videos. I focus on my learning style and then use videos if I absolutely need them.” PH discussed her level of self-efficacy as dependent on the class: “I feel like I am learning more in some classes.” JL recognized the change in the perceived level of difficulty and the impact on his level of confidence: “Before Summit, it was a bunch of simpler stuff and paper pencil. It is harder to study now.” GG shared this sentiment, stating, “Some things I feel I am learning more and some less.” CV stated: “Everybody had certain standards and we tried to reach those to impress them and now we are trying to impress ourselves.”

Another pattern that emerged was the notion of self-directed learning and their role as a student. JL expressed, “There is more work load on the students. Before, teachers walked you through the steps and helped with the process on papers.” MK also noted the shift to more self-directed learning, stating, “We have to get our work done. Our teachers cannot do everything for us. You have to at least try to do the work and learn.” AT talked about her increased role in the learning process, stating, “You have to learn how to take notes and study to pass focus areas. You have to study more than you did before. I learned how to do that on my own.” These statements suggest that students have taken a more active role in the learning process than was their experience prior to the implementation of personalized learning in the district.

### *Student Perceptions of the Role of the Teacher in Personalized Learning*

Many of the student statements surrounding self-directedness pointed to the shifting role of the teacher and the student in the learning process. Students articulated a distinction between teacher-centered and teacher-facilitated instruction. Their statements illuminated the challenges with the transition from their more traditional experience in the classroom to a more personalized experience. LM opined, “The first year I hated it because I was used to the whole class taught together and I fell behind.” AB highlighted the differences across teachers under personalized learning, stating, “It depends on the teacher. Some teachers will tell you what the project is about, the focus areas that come with it, and they tell you the deadline. With other teachers, you rely on yourself.” GG pointed out that in his experience, there remains a certain amount of teacher-centered instruction, stating, “Project days were pretty structured. Teachers talked about what we were going to do and what was happening in a project and how to do the checkpoints.” PW highlighted how the transition to personalized learning challenged some teachers:

-----‘s class was a struggle. She would go through the PowerPoint, lecture for 20-30 minutes, and then say, “OK, Begin” and she would sit down. Then people would talk. She would say you are not listening and she would quit. The project should have taken 1-2 weeks, but it took us 6 months. From beginning of the year, we were behind.

MB explained the process some of his teachers used to frontload and launch a project, enabling students, through facilitation of the teacher throughout, to have agency, self-efficacy, and self-directedness. MB stated, “Most teachers are pretty good about teaching the projects up front, which changed a lot from last year.” MB went on to say, “Some days, the teacher is up and teaching and some we work on our own on projects or on computers working on FAs [focus areas].” These statements suggest the balance teachers are trying to achieve between teacher-centered instruction and student-centered instruction.

Students also revealed the importance of feeling supported and connected to their school. CT shared, “I like school. It is an easy place to learn. I am comfortable with most of the teachers there.” RW conveyed he felt supported, stating, “Teachers always went above and beyond.” LM expressed his thoughts about school this way: “I like learning and the clubs and groups that the school has. There is not much I do not like.” CV added, “I like school because of the social aspect and the teachers are super supportive.” She also indicated that the transition remains imperfect, stating, “Now everyone is more comfortable, but it is still not ideal for all.” Six additional student statements share the sentiment expressed by CV, suggesting potential

implementation issues. MB pointed out the struggle with the transition concerning what teachers do and how it affects his experience:

In 2018-19, teachers did not teach projects and just told kids what to do. They thought Summit taught for them. Some teachers think they do not have to teach. 2019-20 was better, but is it due to different teachers or a school as a whole?

He also pointed out inconsistencies that prohibited an equitable experience for all students, stating, “Teachers help certain students and do not help others. One student took an FA [focus area] 24 times and another got help after a smaller attempt number.” PH indicated that the experience depended on the classroom and the teacher:

In English, [I am] pretty much always on computer reading or writing. Science pretty much on computer the whole time every day, but we did not have a consistent teacher. In 4th period, I switched classes’ mid-year. I did Spanish online first semester and second semester not on computer at all. In drama, the only time we got on the computer was watching play backs and analyzing. In math, [the teacher] would take us through everything. It was more guidance.

Across responses, students shared the guidance they received from teachers to support their growth and development of their agency over their learning, leading them to feel empowered, supported, in control, and having choice, self-paced. AT talked about the resources within the Summit platform, stating:

Teachers now explain what we have to do and we take the content and learn for ourselves. You can always ask for help. I like this much better. I love that we are able to switch [and] have more choice and voice.

CT expanded on this, “I am doing more work now. I did not learn much when teachers stood up and told us. We can ask teachers for help and they will walk us through.” RW spoke of his feeling of control this way, “I had control if I did good or not. It’s all there right in front of you. If you fail, it is your fault.” LM also shared the feeling of control, “In math, I was three weeks ahead and English a month behind...I have more freedom and choice to do what I need to do.” MS expressed his sense of responsibility that was not as evident prior to personalized learning, “I don’t like to stay with my class and tend to go ahead. I learn on my own that is more my responsibility.” PH saw this as a real positive, stating, “You can get ahead and plan out what you want to do on specific days. You can track what you are doing better and improve your grade.”

Another shift with the implementation of personalized learning surrounds the manner in which students and families gain insight into their progress in school. Purposeful feedback appeared 16 times across student responses. LM described it this way, “I feel like I understand where I stand in class based on feedback on the score and explanation as opposed to just a grade and they tell you how to fix it.” RW stated:

With projects, the feedback is most helpful. The teachers will tell you what you missed and point out what I need to do and direct me to resources. I like to have the rubric in front of me because it told me exactly what I needed to do.

While the students reported having a clearer picture of their level of mastery of learning, it has not been without challenges. Students shared examples of inconsistencies. AT explained, “It depends on how good the feedback is. The more explanation the better. Just ‘fix it’ does not work.” JL noted the level and quality of feedback as being teacher-dependent: “Some teachers use the rubric. Some just do the colors [red, yellow, green, represent assessments of work product quality] and some give more specific feedback.” However, in all cases, whether perceived as positive or negative, students revealed greater insight into their progress and their ownership in doing something with the feedback. The grade is no longer an end-point for the student; therefore the student responsibility and ownership for learning has increased.

Students also illuminated the shift from a teacher-centered environment to a student-centered environment on their role in the learning process. AT shared her school experience before personalized learning, “The teacher showed everything on the SMART board and everything was done whole group. Teachers led all the work.” She went on to say, “Before Summit, we depended on the teachers to give us all the information.” Similarly, CT remarked, “Teachers were always in front talking to us. It was whole group versus individual. Whole group was okay, but I could not work ahead and some days I was bored and did not do anything.” MK described it this way, “Teachers were teaching. We did book work, took notes, did papers, wrote on the white board, and did slide shows.” MB shared the same sentiment as his peers and identified his role this way, “Sit, listen to teacher, and raise hand. Everyone was doing the same thing. The teacher decided on the pace.”

Students described that the transition to a student-centered, teacher-facilitated environment was challenging for all, as it was a dramatic shift. CV made a stark contrast. “Before, I felt like the teachers were responsible for our education and if we understood or not. Not in a bad way, but a good way; not if you do not get it—oh well.” She had this to say about the transition, “Students are placing blame on teachers for not doing things...kids do not want to blame themselves. We are not willing to accept that it is our fault.”

MK described the effects of a lack of connection, “I was made to feel like a nuisance in some classes more so than others.” GG expressed the change that mentoring had on his connectedness to school, stating, “I met with my mentor every other week to talk about what I needed to get done and if I was struggling with anything. I enjoyed mentoring.” These statements exemplify the importance students place on knowing that someone cares about them and is there for them.

Many of their frustrations focused on inconsistencies across teachers and the adaptation to personalized learning. These inconsistencies led to uncertainty of their role as a student in the process. AB shared confusion about what she was to do based on the varying levels and timeliness of feedback, “Detail varies. Some just give red-yellow-green. Some go over the rubric before the project...they will tell you what they want- read through it- explain certain things if they do not make sense. Rubrics are there as a reminder.”



AB noted the variability among teachers stating, “It depends on the teacher. Some have favorites and some you do not get along with and some you connect with.” Likewise, MB noted, “It depends on the teacher. Some pick favorites.” This extends beyond the core classroom to mentoring as well. MB continued:

Second hand, I hear mentors do not actually mentor. They sit and the kids just work on their own. It has been 3 months since I met with my mentor. It should be a helpful tool and a lot of kids are missing that because of who their mentor is.

PW pointed out a more concerning scene, “The teacher sits in the corner on the phone.” He added, “Mr. ---- started off great, but then it faded as he realized some kids did not care and he made assumptions.” CV described the variation among teachers, stating:

They sit there quietly, which makes you scared of them. It depends on the teacher. Some I had before. Some are more open than others are. Some would walk around and others sit at their desk and make you come to them during self-directed learning time. Some did a really good job that you understood; some it was like a job to them. They were not having fun. It did not feel like they were doing something they enjoyed—like they are just paid and then leave and some didn’t do much.

### *Student Perceptions of their Peers in Personalized Learning*

Student responses about their peers showed negligible differences in terms of peer relations, interactions, or involvement in their learning experience with the implementation of personalized learning. Students largely focused on whether their peers liked the personalized learning approach in comparison to the traditional approach. AT shared, “I like doing things on my own.” RW expressed, “My friend group likes it. They are more self-paced kind of people. Some people do not like it because they like to be directed, but everything is there that you need.” AB shared there were some opportunities for partner work on both project days and focus area days. JL put it this way, “There is less interaction than before. Everyone is doing different things.” GG lamented the fact that peer interactions were more limited during class, “We used to do a lot of group work other than in math. I love group work because we can help each other. I would like to see more of this.”

When they reflected on previous opportunities in the traditional classroom, students found more similarities than differences. CV said, “We did not have time to talk because the teacher was always talking.” PH conveyed, “Every once in a while teachers would let students work together. JL offered, “There was paperwork that we were all doing at the same time, so a lot was completed together.” RW articulated, “During lecture, there wasn’t as much time for interaction or small group work. We listened to the teacher and then we did our work. Sometimes there was a group project. It depended on the class and the teacher.”

As students further unpacked their experiences, the concept of teacher-facilitated learning became a shift in the conversation. LM shared, “Most teachers give time to work with peers. On project days, we can work in groups.” PW reflected, “There were times to talk, times for small group work—to rearrange our desks and for support through checkpoint rotations.”

CT set the stage with his statement identifying the transition to a student-centered environment, “We used to do whole class. Now we do small groups. Now we are grouped by what we are working on or what we need help with.” LM stated:

In each class, we have in-depth conversations about what we are learning and bounce ideas off each other. It is not just about taking notes. I get to talk about what I think, ask questions and process by having conversations with different people.

### **Teacher Perceptions of Personalized Learning Implementation**

We now turn our attention to teachers and their perceptions of personalized learning and its implementation. We begin by discussing their definitions of personalized learning. We then discuss the teachers’ perceptions of the changes in their roles in personalized learning. We also discuss what they perceive as successes and challenges associated with Personalized Learning implementation.

#### ***Defining Personalized Learning—and Managing Role Changes***

Document analysis of the district’s strategic plan revealed the inclusion of a glossary page to help any stakeholder understand educational terms. Among them was a definition for personalized learning, stating, “Personalized learning refers to a diverse variety of educational programs, learning experiences, instructional approaches, and academic-support strategies that are intended to address the distinct learning needs, interests, aspirations, or cultural background of individual students.” The strategic plan also states that all students will have access to personalized learning.

As was discovered from the review of literature, there is not one consistent definition of personalized learning. Such was the case among the teachers who participated in the GLA. Each teacher’s definition included some key aspects of personalized learning (e.g., individualized learning, student pace, student agency) aligned to the definitions in the literature. Teacher 1 defined personalized learning as, “Students working on assignments and advancing at their own pace and at their own level. Students work on the same set of college/career ready standards with individual support that they need as they learn.” Teacher 4 defined personalized learning as, “the ability for students to work on their personal academic level at their pace, all while using the students’ learning styles and strengths in order to grow as a learner.” Teacher 7 was more specific in the individualized learning aspect stating that personalized learning is, “an approach to meet the needs of each individual student where they are at, their performance level/learning modality, and set high standards for each student to achieve proficient outcomes using personalized pathways.” Teacher 5 gave a definition focused on student voice and choice, stating that, “Personalized learning is giving students voice and choice about what they are learning, how they demonstrate learning.” Teacher 8 perhaps offered the most comprehensive definition that touches upon pace, individualized learning, and, indirectly, student agency. He states:

Personalized learning is the process that allows students to learn at their own pace using specific tools individually needed to be successful—relative to grade level of reading, etc. For some students, this is using visual materials. For others is it hands-on, and so on.

When looking at how teachers describe the difference between the traditional model of education and personalized learning, there was greater consistency. The consistent aspects across the descriptions highlighted individualized learning, small group versus whole group learning, and student pace to a lesser extent. Teacher 2 contrasted the two models, stating:

The definition of a traditional model is “whole group” in which students work on the same assignments at the same time to produce the same outcomes. Personalized learning is individualized instruction, which is tailored to meet the educational needs of different students.

Because personalized learning moves away from the traditional teacher-centered model of instruction to a more student-centered approach, the role of the teacher changes from classroom leader of learning and lecturer to those of facilitator, guide, and supporter of student learning. For example, Teacher 4 stated:

My role during personalized learning is to be the facilitator. I am there when the student needs me. I push them further than what they thought they could go. I support those who need me. I reflect with the student throughout the process.

Teacher 7 gave a similar statement:

My role is as a facilitator of instruction. Rather than the traditional classroom of whole group lecture, it is a process of using student choice, observation, student performance and data collection to provide varying support and resources for specific student needs.

### ***Teacher Perceptions of Successes and Challenges***

The teachers perceive themselves to now having a *backseat role* as they guide students through the learning process, perceiving great advantages and opportunities for students in the personalized framework. For example, Teacher 6 reflected:

In regards to meeting the students’ needs, personalized learning has paved a way for learners to start taking ownership over when their learning breaks down and how to apply fix-it strategies to overcome the learning breakdowns. Student ownership in personalized learning is more pronounced.

However, some teachers expressed concern with its implementation at the elementary level. Teacher 2 noted:

Meeting students’ needs has been very difficult in the lower grades. Students have difficulty transitioning from the primary grades to this model because they have relied on teacher-led instruction. I have found using small groups during this transition has helped quite a bit. Student motivation is a big key in having success in this model as well.

Likewise, Teacher 8 stated:

For some this model works, but overall it is not as effective I would hope it to be. I believe that part of that is because it is not a model that most students have from their early years of school. They are so used to the teacher doing it one way that when they first come into contact with this model of learning, it is hard for them to adjust and therefore they become frustrated and lose motivation because everything becomes overwhelming.

Consistent with existing research (e.g. Deed et al., 2014), some teachers struggled with giving up the control they had in the traditional model. For example, Teacher 5 stated, “I struggle with giving up that feeling of control. In the long run, I know that I am helping my students become more independent, life-long learners.” Teacher 6 agreed but was somewhat more specific:

Transitioning from traditional to personalized learning is both rewarding and difficult. First, you stop being in control of the learning pathways and sometimes that can be extremely difficult to step away from. As teachers, we tend to be great at giving “directions” to others and not so well with taking a backseat! It takes time not to take over when your student is struggling. It takes practice to coach a student who has no implicit motivations and is falling behind. The transition to personalized takes time, patience, and great resources.

There is also the understanding that students undergo this same difficulty of assuming control as the teacher relinquishes it, as seen in the statement from Teacher 8:

Students go from having a teacher lead the instruction to being responsible for learning at their own pace in their own way. This leaves room for some to get behind that normally would not until they are used to this method of learning. I feel like it leaves a lot of room for students who require just facilitation to fall behind.

Teachers noted the importance of reflection on the process, student data, and student work. For example, Teacher 5 noted always asking herself questions, stating, “Did I provide enough modeling and scaffolding? Did I provide enough support to help students reach their goals? I meet with students to discuss how they feel about their progress and develop a plan together to move forward.” Teacher 7 had a similar response connected to lesson planning:

I review student responses and collect data for different student groups to identify student strengths and weaknesses and to assess the effectiveness of the lesson. I then use this information for lesson planning to create small groups to target specific areas of weakness in upcoming lessons.

Unlike in the traditional model, teachers must develop lesson plans that get at the needs of every student and where they are. It is not planning for whole group lessons as the primary mode of teaching. The challenge this creates when trying to personalize a lesson effectively is felt through the response of Teacher 8:

I feel it is important to use data to drive instruction. For some students, this is an easy process. For others it is an immense struggle. I do not feel that personalized learning is

truly a one-size-fits-all approach...At first glance it seems that it would be easier because the student is the lead, but in reality, the timing and the flow of the classroom is so hard to put together so that each student stays up with whatever is assigned. Planning for this type of classroom is time consuming and better be planned out well. Otherwise not only will the students fall behind, but so will the instructor.

Likewise, Teacher 6 speaks to this challenge:

Planning for personalized can be brutal. Being able to meet the needs of all students is time consuming and tricky. Furthermore, being able to plan for multiple tiers of learners in a personalized learning environment is a reflective process that must include the student voice in the planning process.

One of the challenges stated by Teacher 5 was, “Getting everyone—students, teachers, parents, and community—to shift their mindset from traditional education.” Teacher 7 shared his perceptions of the challenges of personalized learning lying within the students, stating:

A student who is apathetic to learning is going to struggle. Students who simply struggle in school are going to have a difficult time knowing what to do next. It is challenging for the teacher to meet 100 different kids, in my position, where they are every single day.

With regard to improving implementation there was one consistent recommendation from the teacher—the need for more training and more resources. They also suggested seeing an exemplary model of personalized learning to follow. Another teacher suggested rethinking the traditional school day in the face of personalized learning in the district.

In spite of the challenges of lesson planning in personalized learning, the teacher participants in our study reported successes of personalized learning, most notably in student engagement. They report higher level of student ownership in their work, becoming more independent as learners, and becoming better goal setters; a finding triangulated by the student participants in our study. Teacher 4 stated, “Students become more engaged in their learning. Students are more independent. Students become great goal setters and know how to reach their goals.” Teacher 6 explained:

Successes of personalized learning are students owning their own learning—students celebrating their own struggles and ways that they worked to overcome them. Successes are students able to articulate when their learning is breaking down and knowing when to call for help and what that “help” should look like because sometimes it won’t just be the teacher.

### **Summary and Implications**

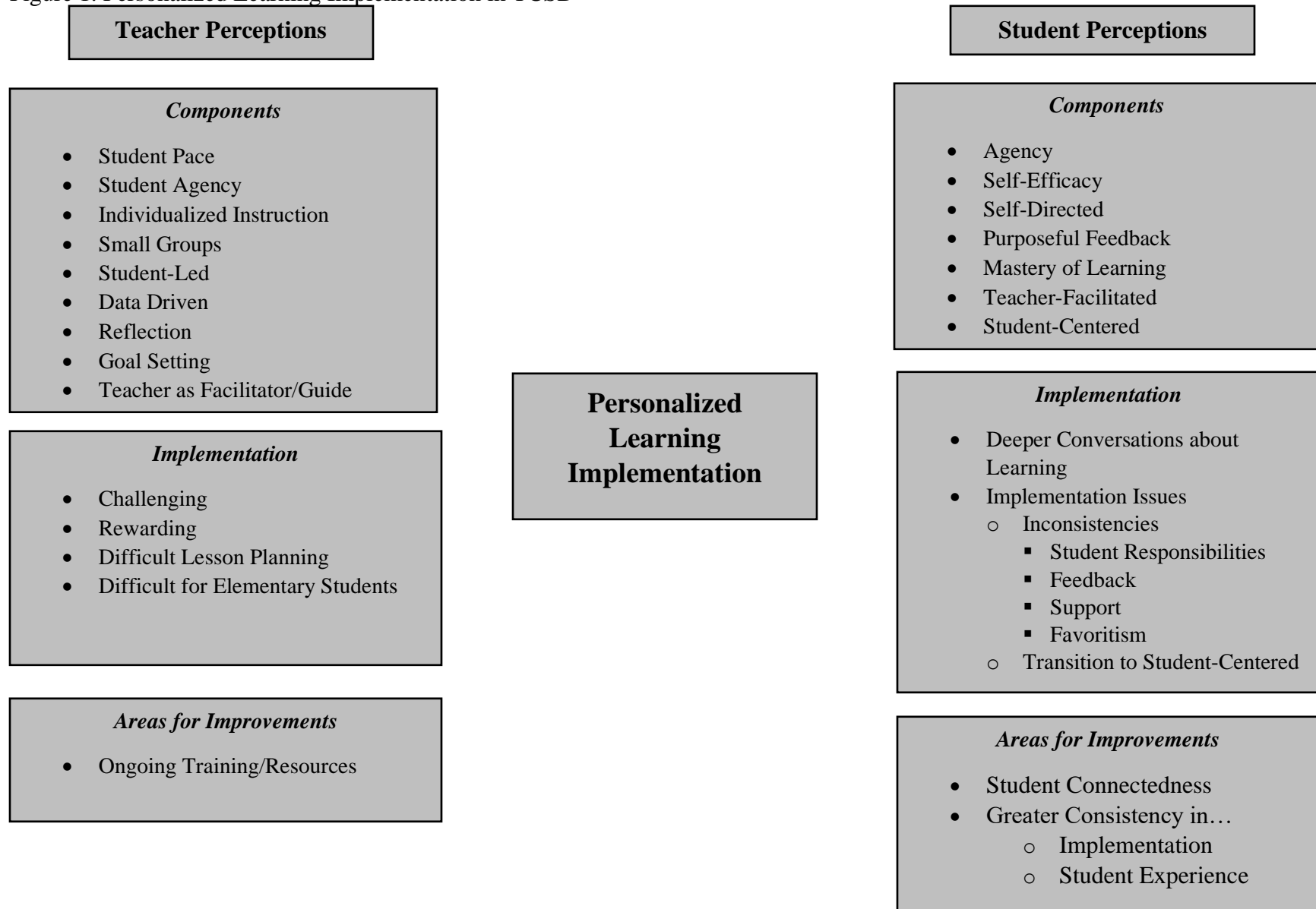
The application of grounded theory methods seeks to generate an integrated and comprehensive theory grounded in the data collected on a phenomenon of interest communicated by means of a figure and interrelated concepts (Tie et al., 2019). In this study, we sought to give voice to students and teachers in an effort to understand their perceptions of the implementation of

personalized learning and improve its delivery (See Figure 1). Students revealed inconsistencies and differences among teachers implementing personalized learning. Students expressed a sense of empowerment and greater control in the learning process in comparison to the traditional approach they had experienced. Student agency affords students voice and choice in how they learn (Deed et al. 2014). The shift from teacher-centered to teacher-facilitated/student-centered was not without its frustrations. Students brought to light the importance of balance in delivery modes and highlighted inconsistencies that led to perceptions of inequitable experiences. In general, students eluded to the discrepancies in the release of responsibility to the student and the levels of support they were provided. Some teachers released students with little to no support, leaving them with no guidance to build their capacity for self-efficacy and self-directedness. They also perceived instances of favoritism among some teachers in how much support they gave and to whom. Interactions with peers were previously about completing an assignment or working on a group project. After personalized learning implementation, peer interactions enable them to have more in-depth conversations about what they are learning. They have time to talk about what they think, what questions they ask, what they learn, and how they learn.

Regardless of district efforts to provide a clear and consistent definition of personalized learning, no consistent definition of personalized learning emerged among the participating teachers. Teacher participants revealed that the implementation has been challenging at times, but in spite of these challenges, they perceive personalized learning as rewarding, improving student engagement, empowering students, and having been a worthwhile endeavor. We found that the teacher's role changed with the implementation of personalized learning. The most notable change that teachers discussed was the release of control they had traditionally, turning those responsibilities, to a degree, over to students. The engagement of students depended on the extent to which teachers were willing to adapt their instruction and learning environment.

We also identified a need for teachers to have more training and support in how they deal with this transition; not only challenging them to change their mindset, but the level of work required in lesson planning and monitoring student progress also needs to be addressed. Personalized learning must be well-planned prior to beginning implementation of the personalized model. It requires a collaborative process in which all stakeholders have an opportunity to understand the complexity of the personalized learning framework in order to reach a consistent vision of what the model will look like when implemented. Research (e.g., Zuckerman et al., 2018) supports the importance of leadership and coherence to educators' implementing educational innovations in rural setting. This requires working to develop a consistent definition of the personalized learning model implemented so that training, resources, and support can be determined prior to implementation. Teacher buy-in and perspectives are key to adoption and successful implementation. While the district that served as the context of this study appears committed to continuing the use of personalized learning in the foreseeable future, only time will tell how long this commitment will remain or whether personalized learning will dissipate as it did in the United Kingdom (Maguire et al., 2013).

Figure 1. Personalized Learning Implementation in TCSD



Future researchers may seek to explore the perspectives of students, teachers, and educational leaders in other districts as each begins the process of implementation and across three phases: pre-implementation, during implementation, and post implementation. Best practice calls on leaders to monitor the effectiveness, as well as the costs, of instructional programs. Future research focused on conducting cost effectiveness and or cost benefit analyses of the implementation of personalized learning may help schools and districts considering implementing personalized learning to calculate cost and compare outcomes and benefits of this instructional pedagogy.

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