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Teacher Feedback and Its Impact on Statewide Assessment Results in Mississippi Career and Technical Education

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Abstract : *Many school districts have adopted formative testing as an approach intended to improve statewide summative test scores, though it remains unclear whether they fully understand what makes formative assessments successful. Teachers should be aware of the nuanced relationships among important factors known to impact the implementation between formative assessments and providing effective feedback for improved learning (e.g., timing of feedback; detail of feedback; frequency of feedback).*

To better understand how teachers' perceptions of feedback practices impact their use of formative and summative assessments for increasing student learning, more than 60 Career Technical Education (CTE) teachers in a career pathway in Mississippi were surveyed on their knowledge of feedback and how effective they felt their feedback practices were to their students' statewide CTE summative testing outcomes. Responses from these surveys were analyzed and mapped to 170 students' formative and summative test scores from their classrooms.

These findings reinforce the vital role that student motivation plays in successful feedback and helps teachers focus on details of feedback delivery that may trigger more positive participation from students. These results also indicate that teachers may overvalue their own knowledge of successful feedback practices and its implementation. Results indicate teacher feedback practices within a classroom setting may benefit from more specific training on feedback engagement strategies.

Keywords: *Assessment, Feedback delivery, Feedback effectiveness, Student motivation, Teacher self-efficacy on feedback*

I. INTRODUCTION

With the advent of the passage of the Strengthening Career and Technical Education Act for the 21st Century (Perkins V Act) in 2018, the United States Department of Education has strongly requested state education leaders realign their Perkins state plans to Every Student Succeeds Act (ESSA). The realignment of state plans has clearly defined performance levels that promote secondary CTE program quality in each state's accountability system (Perry, 2019). Technical skills attainment through dual-credit or statewide summative assessments are typically the choice for most states, as in the case of Mississippi (Bartlett et al., 2011). This programmatic shift has elicited an increase in attainment in industry credentials recognized at the state and national levels (Estes & McCain, 2019). In Mississippi, state education leaders have also worked in recent years to provide formative assessment opportunities for secondary CTE students to promote higher achievement rates on said statewide assessments (Alexander et al., 2020).

The focus of this study is to fill a gap in the educational knowledge of secondary career and technical education (CTE) teachers' formative feedback strategies and their relationships to student achievement on statewide summative assessment results in CTE career pathways. Moreover, the researchers seek to determine whether the presence of formative assessments or other student factors predicted positive results on statewide summative test results. Past studies have examined the impact of the presence of formative assessments (Park et al., 2019), feedback frequency (Salmoni et al., 1984), and feedback quality (Shute, 2008). Recently, studies have spoken to a lack of organized CTE research not only in a systemic manner spanning career fields but also relative to best instructional and assessment practices that promoted better outcomes for secondary CTE

students (Lambeth et al., 2018; Hasselquist & Graves, 2020). Moreover, there are no studies that have examined the relationship between formative assessment results, educator feedback, and student achievement in the secondary CTE realm. This lack of research is critical to inform policymakers, educators, and other stakeholders that have an active role in the career and technical education field.

II. Theoretical Framework

In the early 2000s, the USA underwent an educational revolution that placed a much heavier emphasis on student achievement by way of summative assessments. These new accountability metrics were designed to provide both parents and educators quantitative data that could be used to measure both student and school achievement levels. This new level of scrutiny at schools meant that, fairly or not, teachers and schools were being judged almost exclusively by the results their students achieved on these summative exams (von der Embse et al., 2016). This added pressure forced many teachers and school district leaders to reexamine current practices and adopt new methods or adapt previously used methods that were proven to be successful in increasing student score performances.

Although there are many different strategies available to educators that show promise for increasing assessment score results, many professionals have since turned to the use of formative assessments as one of the most reliable methods for eventually increasing student performance on summative exams. Administrators and teachers who have many options available to them for increased performance seem to be gravitating more towards the use of these formative assessments because years of research have shown that they are some of the more powerful practices that impact student achievement. In their pioneering study on formative assessment, Black and Wiliam (1998) argued that teachers who properly utilized formative assessments could expect greater gains in student understanding compared to other remediation methods at their disposal. These new accountability measures brought on by federal laws such as No Child Left Behind not only resulted in more uses of traditional formative assessment but also a significant increase in non-traditional formative assessments as well. In 2016, *Education Weekly* surveyed school districts throughout the US; astonishingly 83 percent of districts reported utilizing digital platforms to conduct formative assessments (Molnar, 2017).

While the expanded use of formative assessments can be viewed as a positive step in making sure student understanding and achievement are both headed in a positive direction, these results are certainly not guaranteed. Though research has shown formative assessment to be some of the best tools available to educators for improved understanding, it can also be one of the most misunderstood practices in all of education due to the complexity of what makes individual assessments successful or unsuccessful. These crucial assessments can, unfortunately, be used and abused if not given with purpose and understanding of the different steps that teachers should undertake, especially following the assessments. The use of these formative assessment tools is not purely limited to structured written or digital assessments. Formative assessment can take many shapes and forms from those classic written tests all students are likely to remember to answering questions in class posed by a teacher who is trying to gain an understanding of current student knowledge levels on a variety of topics. Any significant discussion about formative assessments simply cannot take place without first discussing the critical role that feedback plays on both the effectiveness and very definition of what makes an assessment formative rather than summative (Alexander *et al*., 2020). Feedback's role in formative assessment could easily be compared to the engine of a car in terms of its importance to the educational process. The process of feedback drives the level of effectiveness of these formative assessments (Sadler, 1998). In academic circles it has been argued that the simple act of providing any type of feedback following any type of assessment to probe a student's mastery or skill level makes the assessment formative in nature, despite whatever its original implementation and goal was designed to measure (Black *et al*., 2003). However, feedback and its effectiveness in terms of formative assessment and the learning process, in general, requires a deeper understanding of the topic and its history to gain a true understanding of its potential role in student achievement.

Feedback has been seriously explored as a topic of academic inquiry for nearly 100 years and across multiple academic fields. It is easy for even the casual observer to understand that feedback plays a central role in not only academic growth and achievement but in many other aspects of life that have little to do with

academics at all. Every adult human being has most likely offered and received feedback hundreds of times on a wide variety of topics and exercises. The idea of feedback playing a central role in expanding people's level of executing skills, tasks, or performances can likely be traced back to the early study of learning processes that started with behavioral psychologists such as Edward Thorndike in the early 1900s. Thorndike studied animal behaviors in controlled experimental settings; through research, such as his famous puzzle box experiment, he determined that animals could learn through feedback given by either positive or negative consequences they received based on their actions (Chance, 1999). One of the more popular theorists in the last 50 years on this topic was former Stanford University Professor Albert Bandura. Bandura's Social Cognitive Theory of learning suggests that people develop and increase skill capacity and performance in large part through observational feedback they receive in the form of rewards or consequences or the personal feedback a person receives when they either succeed or fail at a stated goal they have set for themselves (Bandura, 1989, 1991).

The topic of feedback is so encompassing and important for general growth and improvement that it has many meanings and consequences in all manner of life – both animal and human in nature. In 2002 a study was published in which young songbirds were taken away and denied interaction and feedback with their parents as it related to learning their famous songs (Brainard & Doupe, 2002). The birds had optimal recordings of their signature song played repeatedly for them, but the birds never learned to sing. While this study in ornithology may seem to be simply a sad narrative instead of an important experiment, both brain experts and other researchers say it remains a powerful lesson on the role interaction and feedback plays in not only birds', but people's ability to learn and master certain tasks or processes. According to Jack Shonkoff, director of the Center on the Developing Child at Harvard University, "Those birds never learned to sing even though they heard the song beautifully. There was no opportunity for these songbirds to practice their songs and get this critical feedback from the adults" (2020).

Feedback is such an enormous topic that it can mean many things and it can be delivered to a myriad of different people including peers, colleagues, subordinates, superiors, parents, teachers, and finally students. The crucial role that practice and feedback play in the very nature of human development remains just as vitally important in the work of those in the field of education who are charged with attempting to ensure that students master important course materials and skills. The nature of the learning process itself cannot be nearly as impactful or effective if proper feedback is not given (Guskey, 1987, 2010; Stiggins, 2018).

Although there is little debate about the importance of feedback within the educational profession, there certainly remains debate about almost everything else surrounding the topic. While there are dozens of studies that advocate feedback as one of the best methods for remediation and learning, there are other researchers on the topic that claim nearly one-third of all feedback studies show it harms student learning (Bangert-Drowns et al, 1991). For both academic and everyday educational practitioners, looking for clear advice on how to navigate this subject matter remains a daunting, confusing path with no certain destination as to its conclusion. It is almost as if the importance of the topic is in some ways tied to the intense debate surrounding the subject matter. In Shute's (2008) very popular and detailed meta-analysis on the topic, she writes "there are many conflicting findings and no consistent pattern of results." Perhaps the most telling aspect of feedback research is the amount of disagreement that exists about the level of disagreement on the subject. While some researchers point out the multiple inconsistencies found in the practice and results on feedback, others downplay those findings to say feedback has gotten a bad reputation and only a very small number of studies claim that feedback has little to no effect (Adarkwah, 2021).

The primary reason that feedback and its effects are so heavily discussed and debated more than 100 years after the initial research was done on the topic is that there are so many variables between the student, the instructor, and the environment that impact the practice of formative feedback. These variables can play a significant role in whether or not feedback is positively incorporated to increase learning or whether or not the results are negative to the learning process. These copious levels of intertwined interactions create many different recipes for the ultimate failure or success of formative feedback. Is feedback's ultimate success determined by when it is given to the learner? How much of an impact does the motivational level and learning style of the recipient matter in terms of feedback's success? If you give a great level of detailed feedback to a

performance-oriented learner, does it improve their task execution level or decrease it? The interplay between these variables creates a situation in which feedback may have to take on a Goldilocks aura for a successful feedback recipe of being too much of one thing and too little of another, but instead just the right mixture of these factors.

2.1. Factors Influencing Feedback Delivery and Effectiveness

2.1.2. Timing of Feedback

Perhaps one of the most studied and debated topics about successful formative feedback relates to when it should be delivered to the learner to optimize its impact. This topic has been studied as far back as the 1920s when psychologist Sidney Pressey advocated for more immediate feedback being given to students to facilitate academic growth. This prevailing thought on providing feedback sooner rather than later continued in large part until educational psychologist Raymond Kulhavy and his associates challenged this notion. Kulhavy, the former journal editor for *Contemporary Educational Psychology*, both dispelled long-standing myths about feedback and greatly enhanced future generations of researchers' understanding of the topic and how it works most effectively.

Kulhavy, like many researchers still argue today, believed that the appropriate mechanisms for feedback to work successfully were misunderstood by many in his time (Kulhavy, 1977). Kulhavy asserted that learners who did not receive feedback immediately were more likely to retain the right answer following a delay in feedback because essentially their minds had forgotten the incorrect responses they first provided (Kulhavy & Anderson, 1972). This idea that delaying feedback increased student outcomes on assessments or tasks was eventually refuted when Kulik & Kulik (1988) wrote a meta-analysis on feedback timing. They argued that while in some specific, almost contrived situations, delayed feedback may seem more beneficial, most studies showed that in a real classroom setting immediate feedback proved far superior to increasing achievement. Shute (2008) alluded to this as well by observing that many studies on feedback done in the field or a real-world learning environment tend to support giving the learner immediate feedback while those studies done in lab settings show more instances of delayed feedback being a positive approach. This idea of better results of feedback occurring for field-based work is also supported by other researchers working in actual learning situations (Colby & Stapleton, 2006). The debate around the timing of feedback is far from over as modern researchers continue these decades-long discussions about the benefits of delayed feedback (Smith & Kimball, 2010) compared to those who still suggest that immediate feedback yields superior results (Lemley, *et al*., 2007).

2.1.3. Motivational Influences of the Learner

Though several factors interact to influence the effectiveness feedback has, some researchers would likely argue that motivational factors of learners play some of the most important roles in this area of study. Someone researching various feedback strategies' effects cannot escape many different motivational factors that are likely to impact whether a learner is both willing to accept and/or act on the feedback they receive (Zarei *et al*., 2020). On the superficial level, learner motivation may seem as though it is strictly about the learner's willingness to receive feedback; however, instructors share a burden of making sure their practice of providing feedback does not negatively impact an already apathetic learner. It is crucial for those instructors in classrooms to understand the many factors that influence student motivational levels and those educators' impact on these motivational levels. Many meta-analyses on feedback have various subtitles that could be argued should fall under the guise of motivation because they either directly or indirectly impact student motivation, self-efficacy, and apathy. For the purpose of this theoretical review, we are combining both student and teacher factors that could impact student motivation into this single subtitle. After careful examination on the feedback topic, researchers could probably draw the conclusion that when the practice has been reported to hurt student achievement, it can probably be linked in some way to decreasing student motivational levels.

Bandura's social cognitive theory of learning suggests that there is a careful mix of student motivation, use of learning strategies, and responding appropriately to feedback that all play a significant role in student mastery and ultimately achievement. To better engage students in self-regulated learning processes, teachers

need to understand their role in the interaction between environmental factors like offering feedback and a student's perception when it comes to enhancing the learning process (Wang & Lin, 2007). Certainly, many teachers are aware that student motivation and perseverance are key factors to a quality learning process that ultimately impacts students, but they may underestimate their role when it comes to impacting a student's motivational level. The crucial role teachers play as the deliverers of information cannot be overlooked, but their role in nurturing relationships with students and providing quality feedback should not be ignored. While many teachers do an excellent job of understanding these different factors at work that contribute to student motivational levels, it has been reported that some teachers undervalue student motivational levels based on student characteristics, such as their perceived socioeconomic level (Brandmiller *et al*., 2020). Instructors can impact student motivational levels in an ancillary manner simply by creating learning environments that are not so constrictive that they rob learners of any feelings of autonomy (Utman, 1997). Cordova & Lepper (1996) also came to similar conclusions by studying the impact that personalization and choice had on elementary students' intrinsic motivation levels.

While instructors can have some level of influence on student motivation and apathy based on their practice of how feedback is given, it remains clear that students' motivational levels are largely the result of many different intrinsic and extrinsic personal motivational characteristics as well as social and environmental factors that are all intertwined. Bandura (1999) touched on some of these interactions by stating that students with higher levels of self-efficacy were more likely to employ more detailed feedback strategies they were given in order to achieve their learning goals. Narciss and Huth (2004, 2006) have done perhaps some of the best work in regard to the interaction between feedback, self-efficacy, and motivation and the resulting dynamics effects on students. The research duo believes that there is a significant, interrelated relationship between the learner's motivation based on their beginning self-efficacy, how complex a task is that they need to master, and the type and quality of the feedback they receive (2004). Although there is little doubt that external factors can help to shape or form students' motivational levels, there also needs to be an understanding that students can ultimately be motivated by many different factors, such as their underlying psychological processes. Expanding on Bandura's work in social cognitive learning theory, Dweck & Leggett (1988) argued that most students approach learning with one of two possible goals because of their psychological dispositions. The pair asserted that students either set out with a goal of learning and mastering a new task (learning-oriented) or students want to gain a new skill to impress others (performance-oriented). The obvious implications of these types of intrinsic or extrinsic psychological processes students possess on feedback are still being examined, but there is evidence that performance-oriented learners will specifically avoid tasks that may result in them receiving negative feedback which could ultimately affect their level of growth (Gong *et al.*, 2017). If some learners subconsciously avoid certain tasks because they fear the type of feedback they may receive, these learners may be less likely to properly synthesize and apply feedback for a variety of reasons.

2.1.4. Feedback Frequency, Specificity, and Type

The timing of when feedback is provided and what motivational factors are at play for students are also vital when considering how to approach offering feedback. Questions in the study of feedback remain about such issues as how frequently it should be offered and how specific it should be in order to maximize an appropriate student response. Much like the other research issues involving feedback, these areas of concern are also riddled with inconsistencies in terms of what researchers or teachers may advise.

Some advice regarding feedback postulates that the more feedback a learner has about their performance, the more likely they are to retain information about what the correct response should be, and thus improve their performance. Numerous studies over the past few decades have indicated that more feedback results in better performance as compared to offering infrequent or no feedback to learners (Park *et al*., 2019). In regard to specific response performance in the area of learning new motor skills, research demonstrated that the more frequently feedback occurred, the better the learning process seemed to have worked (Salmoni *et al*., 1984). Despite some of the prevailing thoughts regarding how often feedback should be given, more recent research is disputing this claim of more being better. In an exercise designed to test participants' decision-making ability researchers discovered that the frequency of feedback worked to a certain degree, but as participants received almost continual feedback, their performance declined. The researchers believed that too

much feedback overwhelmed the learners and taxed their cognitive functioning to a point where it decreased their ability to effectively perform the task (Lam *et al*., 2011).

If a motivated learner is provided feedback at the right time at the correct frequency, that unfortunately still does not guarantee positive results, however. Not only have questions arisen and debate been stirred by these already mentioned topics regarding feedback, but also about how specific the feedback provided needs to be to elicit the desired improvement. Early research on feedback dealt with what was commonly referred to simply as Knowledge of Results (KR). This type of feedback only went as far as to inform learners on whether or not they achieved the desired results of a task (e.g., *You passed the assessment*, or *You did not pass your driving test*). This specific feedback offered little explanation and advice to the learner regarding the actual elements of their performance. Kulhavy and Stock (1989) were among some of the early researchers that called into question the very basic nature of feedback and whether or not it could be more effective if it was more specifically tailored to the learner's needs and deficiencies. Kulhavy and Stock proposed that feedback should not only give results but should point out incorrect responses, offer explanations for responses, and hints or strategies for solving errors. New evaluations of existing research lend credence to Kulhavy and Stock's early assertations about more specific feedback being needed, as Shute (2008) urged that feedback should at least verify students' answers as right or wrong and provide additional information about what the correct answers are if it is to be effective.

These many factors that influence the quality of feedback are nearly mirrored by the various types of feedback a learner can be given as well. Various types of feedback that have been researched in the past include things such as topic contingent, accuracy of the solution, worked examples, response contingent, and partial solutions, just to name a few. In their acclaimed conceptual analysis regarding feedback, Hattie and Timperley (2007) stated that feedback worked on four separate levels of understanding from task level, process level, self-regulation level, and self-level. These various types and levels of feedback can have tremendous sway in not only how feedback is received by the learner but also its ultimate effect. Small changes in the delivery of feedback at each of the levels that Hattie and Timperley proposed can have consequences that are either positive or negative regarding effectiveness. For example, the researchers argue that feedback given on the self-level is the most often given in classrooms, but it is also the most often ineffective. The researchers claim this type of feedback – when a teacher personalizes very generic feedback in the form of stating something like "good girl" or "good effort" – can have negative consequences because learners believe the feedback represents themselves rather than their performance on a specific task. The reasons for negative consequences are fairly simple in that learners will eventually be given negative feedback about their performance on a task, and the news is discomforting to them because they perceive the feedback as personal in nature.

While negative feedback at the self-level of Hattie and Timperley's model may have adverse consequences, that certainly does not always mean that feedback has to be positive to be effective. Early feedback that provided a higher level of detail than simple Knowledge of the Results often focused on the positive aspect of giving feedback to learners. In many of these situations, learners were told when their responses were correct and were reaffirmed by those offering the feedback. Again, Kulhavy and his colleagues played a key role in dispelling these existing myths that positive affirmation was the most effective type of feedback. Kulhavy, Richard Anderson, and Thomas Andre (1971) were some of the first researchers to gain prominence in the area of feedback by asserting that these earlier scholars' previous beliefs about positive feedback being the most powerful kind of feedback had been incorrect for decades. Kulhavy and his associates strongly believed that correcting incorrect responses was the most valuable way in which to deliver feedback. However, as with most aspects of feedback, this belief by Kulhavy and his colleagues is being challenged. Some recent researchers claim negative feedback can distort learning and decrease performance in certain situations by damaging relationships between those offering and receiving feedback (Fedor et al., 2001).

III. RESULTS AND DISCUSSION

3.1. Overview of Methodology and Results

The current work investigates the impact of low-stakes formative testing, teacher feedback styles, and student motivation on Mississippi CTE students' summative testing scores. Results are reported and discussed incrementally. The current work extends an existing body of literature by exploring the efficacy of formative assessment and feedback in non-traditional education programs (CTE) within an understudied geographical region (Mississippi).

3.1.2. Pilot Study

To explore the role of MS CTE teachers' self-efficacy in administering feedback on formative assessments, a new questionnaire assessing teachers' feedback styles and the perceived efficacy of their feedback was developed (adapted from an instrument used by Winsone and Boud, 2019) and implemented via Qualtrics. Students' formative and summative testing data was collected in the Spring of 2019, but the feedback questionnaire tool was developed and validated in a pilot study afterwards (before any analysis of students' testing data). The questionnaire was sent to all CTE teachers at one school in MS, and the reliability of the resulting data (n=14) was analyzed. Analysis of the teachers' responses on the pilot questionnaire demonstrated strong reliability ($\alpha = 0.91$), indicating that the questionnaire reflects a valid and reliable measure of teachers' feedback self-efficacy. The questionnaire was modified based on pilot results and finalized for use in the present study. A summary of the measures tested on the questionnaire are provided in **Table 1**, highlighting specific categories of interest (i.e., quality of feedback, student's active participation with feedback, & detail of feedback) and relevant example items associated with such categories (if applicable). For example, *quality of feedback* included sub-categories that were assessed such as "timing of assessment tasks influenced quality of feedback" and "knowing the student well." The *student's active participation with feedback* included sub-categories such as "your feedback helps students identify gaps in their knowledge" and "students discuss your feedback with you." Items regarding *detail of feedback* were evaluated on a ten-point slider scale (0 = not at all to 10 = extremely) while items concerning quality of feedback and student's active participation in their feedback were assessed on a five-point Likert scale (not at all to always/great deal). Results are reported and discussed below in relation to the relevance of these factors in reference to their impact on statewide testing.

3.1.3 Current Study – Methods and Procedure

Two optional formative practice tests and a non-optional statewide summative tests were administered online to MS CTE students in Spring of 2019. Teachers participating in formative testing were asked to allow at least a week between tests so that feedback could be offered and incorporated accordingly after each test. Validation of the feedback questionnaire occurred in the Fall of 2019 (described above) and the finalized questionnaire was implemented in the Spring of 2020 for use in the present investigation. The final feedback perception questionnaire was widely administered to all MS CTE teachers within the Agricultural Environmental Science Technology (AEST) pathway who were asked to reflect on the efficacy of their feedback as it pertained to their students' formative and summative test performance that was collected a year prior. Sixty-two teachers across MS completed the questionnaire, though only 33 of them provided full data capable of being analyzed. Within this larger sample of MS CTE teachers (n=33), the feedback perception questionnaire again demonstrates good reliability, $\alpha = 0.84$.

The feedback perception data from these teachers were then mapped to their students' previously taken statewide formative and summative assessments, allowing for an investigation of the relationship between teachers' feedback perceptions and their students' actual performance. Of the entire population of MS CTE students and teachers surveyed in this research, 170 students completed all three assessments (2 formative, 1 summative) and were capable of being connected to the feedback perception data provided by their CTE teachers (n=11). The following analyses therefore include only these students who completed all three assessments and whose teachers provided full response data on the feedback questionnaire, while excluding all other incomplete data. Descriptive statistics and bivariate Pearson's correlations are provided in **Table 2** for performance on all tests.

3.2. Formative Testing Relates to Improved Summative Test Scores

Within-subjects bivariate partial correlations were first conducted to examine the independent contributions of each instance of formative testing in explaining summative test performance. First, even when controlling for performance on Formative Test 2 (FT2), Formative Test 1 (FT1) and summative test scores ($r_{bivariate}$ = 0.67, p < .01) still retain a strong positive relationship, $r_{partial}$ = 0.30, p < .001. This finding suggests that the first instance of formative testing bears a unique relationship to improved summative test scores, regardless of the impact of a second opportunity to test formatively (and receive additional feedback). Similarly, when controlling for variability in performance on FT1, FT2 and summative test scores ($r_{bivariate}$ = 0.71, p < .01) also retain a strong positive relationship, $r_{partial}$ = 0.42, p < .001. This finding indicates that the second instance of formative testing also uniquely relates to improvements in summative test scores, regardless of the impact that a prior opportunity to test formatively (and receive feedback) may have had.

A hierarchical linear regression was also conducted to support these conclusions from a slightly different lens. In this model, summative scores were entered as the dependent variable, and FT1 and FT2 were entered in the first and second steps, respectively. As reported in **Table 3**, both instances of formative testing explained unique variance in summative test scores, with FT2 explaining additional variance in summative performance above and beyond that of FT1. These results indicate that summative test scores not only improved after students completed one practice test, but they improved even more after completing a second practice test.

3.3. Teacher Perceptions of Feedback do Not Predict Summative Performance

A separate set of analyses investigated whether the unique relationship between each instance of formative testing and summative test performance could be attributable to the feedback provided by teachers afterwards. Another hierarchical linear regression was conducted to examine how the items on the teacher feedback perception questionnaire might mitigate the previous findings. First, subsets of scores across items assessing feedback quality and student engagement with feedback were averaged and analyzed in relation to FT1, FT2, and summative test scores. In a hierarchical linear regression with FT1 and FT2 in the first two steps and average feedback quality entered in the third step, feedback quality independently predicted summative scores above and beyond that of FT1 and FT2 ($\Delta R2$ = .01, β = .11, t (169) = 2.05, p = .04, 95% CI = [.081, 4.354]). In a separate hierarchical linear regression with FT1, FT2, and average student engagement scores entered in the first three steps (respectively), student engagement with their teachers' feedback did not uniquely predict summative scores above and beyond that of FT1 and FT2 ($\Delta R2$ = .002, β = -.05, t (169) = -0.86, p = .389, 95% CI = [-2.79, 1.093]). When detail of feedback is included in the hierarchical model, no other individual questionnaire items or composite feedback areas predict summative test performance above and beyond that of formative testing and detail of feedback. For example, despite the previously reported (marginal) impact of average feedback quality on summative scores, when detail of feedback is included in the model, feedback quality is eliminated as a significant predictor ($\Delta R2$ = .00, β = .02, t (169) = 0.29, p = .774, 95% CI = [-1.996, 2.678]), while detail of feedback retains its significance as a unique predictor above and beyond effects of formative testing ($\Delta R2$ = .04, β = .20, t (169) = 3.42, p = .001, 95% CI = [.697, 2.598]).

IV. FIGURES AND TABLES

Table 1. Teacher Perception Questionnaire Summary

Sub-Category	Question & Response Options	Example Items
Quality of Feedback (6 items)	Q: Reflecting on the 2018-2019 school year, please rate how the following factors influenced the quality of feedback you provided to individual students. R: 5-point Likert scale ('not at all' to 'a great deal')	-Own workload -Timing of assessment tasks -Students' standard of work -Your experience teaching the unit -How well you know the student

Student Participation w/ Feedback (11 items)	Q: Thinking of assessment feedback you generally provide to students, please rate how often the following occur. R: 5-point Likert scale ('never' to 'always')	-Your feedback helps students improve future performance -Your feedback helps students identify gaps in their knowledge -Your feedback directs students towards the most appropriate strategies for learning -Your feedback motivates students in their studies
Detail of Feedback (1 item)	Q: In 2018-2019, how detailed were the feedback comments you generally provided to students after receiving the results from practice testing? R: 10-point sliding scale ('not at all – 0' to 'extremely – 10')	Q: In 2018-2019, how detailed were the feedback comments you generally provided to students after receiving the results from practice testing?

Table 2. Two-Tailed Bivariate Pearson's Correlations and Descriptive Statistics.

	Summ	FT.1	FT.2	Min	Max	Mean	SE	SD	Skew	Kurtosis
Summ	1	-	-	26	88	60.86	0.98	12.73	-0.17 (0.19)	-0.17 (0.37)
FT.1	.67**	1	-	22	86	54.12	1.05	13.64	-0.19 (0.19)	-0.33 (0.37)
FT.2	.71**	.75**	1	20	86	56.04	1.16	15.09	-0.48 (0.19)	-0.41 (0.37)

Note. $^{**}p < .01$. $N = 170$.

Table 3. Effects of Formative Tests 1 & 2 on Summative Test Scores.

	R^2	F	ΔR^2	ΔF	B	SE	β	t	p	95% CI for B
Step 1	0.45	138.85	0.45	138.85**						
FT.1					0.63	0.05	0.67	11.78	0.000	[.523, .733]
Step 2	0.55	101.88	0.10	35.99**						
FT.1					0.30	0.07	0.32	4.12	0.000	[.156, .445]
FT.2					0.40	0.07	0.47	6.00	0.000	[.266, .526]

Note. Each model is compared to the prior model(s). $^{**}p < .01$ (two-tailed).

V. Conclusion

Findings of this study clearly suggest that the presence of quality feedback from secondary career and technical education teachers toward students prior to the statewide summative assessments makes a difference in students' learning outcomes. The positive learning outcomes on the summative tests, however, fluctuated, hinting at lack of student motivation due to varied "stakes" policies implemented by school districts and other student-level factors. Overall, the secondary CTE teachers included in the study felt the levels of quality feedback provided after formative assessments "helped students' future performance" and identified gaps in their knowledge in preparation for the statewide summative assessments. The results of the questionnaire suggest that if quality of feedback is defined as a detailed level of feedback, then it is a significant predictor of positive student outcomes. Detail of feedback elicited a stronger predictive trait than formative testing alone in the absence of detailed feedback.

These findings highlight the importance of detailed instructor feedback and echo the work of Guskey (1987, 2010) and Stiggins (2018), who showed that educators must provide appropriate feedback with detailed

results if there is a hope of sustained and consistent learning outcomes. Thus, it is important for CTE administrators to guide educators in proper use of formative results and feedback mechanisms to avoid situations like the overuse of formative assessments without proper feedback (Morgan et al., 2018). Historically, learner motivation regarding secondary CTE statewide assessments delivered in Mississippi has been called into question due to the nature of the stakes surrounding the assessments. Students may or may not find extrinsic value in a state-level third party assessment that may not have college or career implications attached to the results of the assessments. School districts and the states' department of education have increased incentives for students, such as graduation diploma endorsements, scholarships, and qualifiers for national certification vouchers. More research is needed from a student perspective to gauge the motivational influences of the secondary CTE student to explore whether or not those findings are like the results from the Zarei et al. study (2020) that suggested that without the presence of motivation from the student, feedback has negligible effects.

This study does have some limitations: first, the sample consists of 60 secondary, high school career and technical education teachers in one career cluster in Mississippi. As such, the results can only be generalized to similar secondary, high school career and technical education teachers in Mississippi. Other studies in other states may produce similar results, but factors such as statewide CTE assessment practices, curriculum designs, and educator requirements may prove confounding in nature. It is hoped that future researchers will carry out similar studies involving secondary CTE teachers in other states. Second, this study explores student learning outcomes and teachers' perceptions of formative assessment feedback. Students' perceptions were not explored to examine their self-efficacy toward preparation for the statewide assessments and lens of the quality of feedback they received. Therefore, future researchers could examine how secondary CTE students were motivated intrinsically or extrinsically before the statewide assessment period and its relationship on statewide assessment results in multiple secondary CTE career pathways. It is also hoped that future researchers will explore CTE teachers' feedback strategies more closely and pair those findings with a professional development plan to further promote a school climate that facilitates high academic achievement.

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