EDUC 675 Research in Secondary Education
Teacher Research Project Description and Assessment Rubric (60 points)
(Includes suggested page lengths for each section)

Title Page and Abstract (2 points possible)
Your title can be as creative as you like—take researcher/artistic license with this. In 125 to 150 words, what was your study about? What was your major finding? An abstract writing strategy: take one sentence from each section of your final project (introduction, literature review, methodology, findings, and discussion) to craft the perfect abstract.

Consider the following questions as you draft your title and abstract:
1) Have you provided a single, articulate, concise paragraph of no more than 150 words?
2) Does your abstract concisely describe your purpose and the context, method, key findings, and significance of your research?

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<th>Rubric Score</th>
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<td>Title and Abstract</td>
<td>Project is so brief, incomplete, or off-topic that any reasonably accurate assessment is impossible.</td>
<td>Project includes only general statements about the study. Information on methods and procedures to be followed is sketchy or missing. Falls short of 150 words or greatly exceeds the 150-word limit</td>
<td>Project includes an identifiable summary (max 150 words) that addresses the purpose of the study. Touches on methods and procedures to be followed, but is not sharply focused.</td>
<td>Project includes a concise (max 150 words) summary that reports factually on the purpose of the study and the methods and procedures to be followed.</td>
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Introduction, Rationale, Area of Focus, and Research Questions (5 points possible)
Briefly describe the setting, including the community, school, students, and other relevant information. Demographic information in your introduction should focus on your school, while demographic information in your methodology should focus specifically on the students you worked with in your study. What is the purpose of your study? What problem or issue are you addressing? Describe why the concerns are important to you and what your research might help you learn as a result of its conduct. What is its background and significance? What is (are) your research question(s)? Do you have a hypothesis? If so, what is it and how did you formulate it? Be sure that your research questions steer you toward a descriptive response. Consider the following questions as you draft your introduction, rationale, area of focus, and research questions:
1) Have you explained the outgrowth of your study?
2) Have you offered perspectives that shaped this question for you?
3) Have you situated the study in terms of explaining the outgrowth of these questions in the context of your work? (e.g., your students, classroom, school, district)
4) Have you clearly and concisely explained why this research is important? Have you Intro Section Guidelines addressed the broader educational and social significance of this research?
5) Have you clearly and concisely stated the research problem?
6) Have you clearly and concisely stated your main research question and any sub-questions?
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<td>Introduction, Rationale, Area of Focus, and Research Questions</td>
<td>Project is so brief, incomplete, or off topic that any reasonably accurate assessment is impossible.</td>
<td>Project includes minimal information on the context/theoretical framework for the study. Does not offer a rationale for the study's execution, or does so only superficially. Explicitly states the research question and purpose of the study.</td>
<td>Project includes an adequate context/theoretical framework for the study and a defensible rationale for its execution, though one or both may be weakly developed. Explicitly states the research question and purpose of the study.</td>
<td>Project includes a sound context/theoretical framework for the study and a compelling rationale for its execution. Clearly and explicitly states the research question and purpose of the study.</td>
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**Literature Review (8 points possible)**

In order to properly address a research question you need to be familiar with previous investigations of your topic. You should conduct a literature review in which you cite and synthesize a minimum of ten (10) sources and discuss how they informed your design. Teacher research appeals to a broad range of research resources, including reports of teachers’ experiences. Transitions should connect one annotated source with the next. At the end of the literature review, include a one-paragraph summary of the major discoveries in your review, connecting these to the focus of your study. References must be from refereed journals, books (generally not textbooks), curriculum resources, and scholarly compilations. NOTE: The literature review should emphasize synthesis and analysis (Bloom, 1956, 1984). *Use direct quotes very sparingly.* Craft your literature review as a story of the study of your topic. Consider the following questions as you draft your literature review:

1) Did you conduct an ongoing literature review which informed your research?
2) Is the review relevant and connected to your study?
3) Is the review adequate, coherent, and analytical?
4) Does the review include references from a variety of sources?
5) Is the review integrated into a conceptual framework with a mapping of the theories, literature, and phenomena that help to inform your study?

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<td>Literature Review</td>
<td>Project is so brief, incomplete, or off-topic that any reasonably accurate assessment is impossible.</td>
<td>Project includes fewer than 8 peer-reviewed cites, published reports of empirical research. Does not explicitly highlight gaps in the literature to which the proposed study will respond. Summarizes cited works sequentially, rather than synthesizes and organizes them thematically. Relies heavily on direct quotes.</td>
<td>Project includes at least 8 peer-reviewed cites, published reports of empirical research. Highlights gaps in the literature to which the proposed study will respond. Organizes the literature by identifiable themes, although organization within themes may follow no clear or consistent pattern of presentation. Attempts to synthesize referenced sources. Uses few direct quotes.</td>
<td>Project includes at least 10 peer-reviewed cites, published reports of empirical research. Highlights gaps in the literature to which the proposed study will respond. Organizes the literature by clearly identifiable themes, proceeding from general to more specific within each theme. Effectively synthesizes referenced sources, using few, if any, direct quotes.</td>
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Description of the Method (15 points possible)
In this section describe how you implemented your research. Include a description of subjects (i.e., students, teachers, administrators), the context of the research, the strategies and materials (put sample material in an appendix), the number and total time of each research session, and a complete description of the methodologies. Repeat your question(s) in this section—remind us often what you are studying. Describe how you selected your subject sample—why did you choose these individuals and who are they, in terms of gender, ethnicity, age, grade level, language/culture, and educational achievement? Describe ALL of your methods, including what influenced the selection of your methodology and design, what measures you took to assure the validity of your study, and how you triangulated your data. Be sure to include a table and timeline of your methods—what you collected and when. Be sure to describe what type of data you collected—for example, did you do a needs assessment (e.g., via a test) to address student achievement, and then design and implement a new instructional strategy? Or did you observe a group of students to see how they behaved in a particular context, and then interview them to ascertain their reasons? Did you do a series of in-depth interviews with students or teachers? How do the data relate to your research question? How do they relate to your masters curriculum? Finally, describe how you planned to make sense of—analyze—your data in light of your research question(s). Provide rich descriptions of HOW you reviewed your data, the themes that became apparent in your reviews, and your ultimate findings.

Consider the following questions as you draft your literature review:
1) Have you described your research context, including your community, school, and classroom contexts?
2) Have you included demographic information of participants?
3) Did you include your reflection of the problem (e.g., behaviors observations, possible causes)?
4) Have you explained the reasons for your pedagogies based on your observations of your classroom and the literature reviewed?
5) Have you described in detail what data you collected, how you collected it, and when you collected it, including data generated from your pedagogies and strategies?
6) Are your data from multiple sources?
7) Did you include a description of the pedagogical strategies you enacted?
8) Did you explain how you analyzed your data?
9) Have you included and explained the role of your peers in your data interpretations and validation?
10) Did you explore using visuals and technologies for analyzing and displaying your findings in a coherent manner?

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<td>Description of the Method</td>
<td>Project is so brief, incomplete, or off-topic that any reasonably accurate assessment is impossible.</td>
<td>Project includes explanation of the study design, procedures followed, sampling methods, and analytical tools (including any statistical tests), given the stated purpose of the study; explanations, however, are not fully developed.</td>
<td>Project includes explanation of the study design, procedures followed, sampling methods, and analytical tools (including any statistical tests), given the stated purpose of the study. Discusses ethical issues</td>
<td>Project includes explanation and justification of the appropriateness of the study design, procedures followed, sampling methods, data collection and analytical tools (including any statistical tests), given the stated expectations</td>
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<td>Mentions ethical issues raised by the study but addresses them only superficially.</td>
<td>raised by the study and how they were addressed.</td>
<td>purpose of the study. Discusses ethical issues raised by study and explains how they were addressed.</td>
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Results and Findings (15 points possible)

In this section, indicate what you discovered or found as a result of your data gathering. Focus on results that are related to your research concern and answer your research questions or shed light on your research hypotheses. Introduce your findings before you begin to describe them, and remind us of your research question again. Organize this section in a way that makes sense for your data/findings—by student, by theme, by data source, etc. Use illustrative examples from your data to SHOW us your findings. Use tables to summarize and SHOW us what you’ve learned. Focus on what’s truly interesting in your findings, even if you have limited data to support this. Feel free to use mini case studies to illustrate your findings, through the lens of a few students. Remember that the goal is to share what you learned about your teaching for yourself first; our goal is not NECESSARILY to extract findings that will be generalizable across EVERY teaching setting. Interpret your data in as much detail as possible, describing whether or not—or how—your findings corroborated your expectations. Were there any surprises in your findings? Can you think of alternative explanations for your findings?

Consider the following questions as you draft your results/findings:
1) Did you restate your research question and what was found through your research?
2) Are the findings thoroughly and adequately presented?
3) Is there convincing evidence to support your themes?
4) Is there connection and coherence among the separate themes?
5) Did you explain your findings to peers and colleagues to gain their perspectives on your interpretations?

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<td>Results and Findings</td>
<td>Project is so brief, incomplete, or off-topic that any reasonably accurate assessment is impossible.</td>
<td>Project includes reporting and interpretation of narrative and numerical data with little apparent concern for accuracy and objectively. Analytical tools are inappropriate to the methodology. Provides, at best, tenuous links between study outcomes, hypotheses (if stated), and the original research question.</td>
<td>Project includes reporting and interpretation of narrative and numerical data accurately, objectively, and concisely. For the most part, analytical tools are appropriate to the methodology. Does not highlight explicit links between study outcomes, hypotheses (if stated), and the original research question; however, such links may logically be implied.</td>
<td>Project includes reporting and interpretation of narrative and numerical data accurately, objectively, and concisely using analytical tools appropriate to the methodology. Highlights explicit links between study outcomes, hypotheses (if stated), and the original research question.</td>
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Suggested 8-12 pages
**Discussion, Reflection, Implications, Recommendations, Impact Presentation, and Action Plan (10 points possible)**

In this section reflect on the findings of your data collection and discuss what they might mean to you as a teacher and teacher researcher. What did you learn from the study? How did it relate to your masters curriculum? How will it influence your teaching—that is, based on the results and themes that emerged from the study, what changes will you make in your teaching? How will you share these findings with others—specifically, how did you share your project and its results via your “Impact Presentation”? What are the implications for future research? Speculate on what it would mean if your data pointed in one direction versus another. Again, focus on what’s truly interesting in your data/findings, even if you have limited information to support this. Make some bold recommendations for how we might serve students better. Be sure to describe what all of this information—the teacher research process, your data, your findings—mean to you as a professional and a person. Describe how you might share the findings of your paper—with your principal, your grade level team, other teachers who are working with these students, use it in a workshop, claim it as an area of expertise on your resume, etc. Be sure to describe potential implications of your study and its findings for other teachers and for education policymakers.

Consider the following questions as you draft your discussion, reflection, implications, recommendations, and action plan:

1) Have you adequately explained the implications of your study for your students’ learning?
2) Have you adequately explained the implications of your study for your professional development?
3) Have you adequately explained the implications of your study for your teaching and reframing of your practice?
4) Have you adequately explained the implications of your study for the education field?
5) Have you adequately explained the relevance of your study for national and state education standards?
6) Have you discussed any limitations?
7) Have you identified areas for future research possibilities?

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<tr>
<td>Discussion, Reflection, Implications, Recommendations, and Action Plan</td>
<td>Project is so brief, incomplete, or off topic that any reasonably accurate assessment is impossible.</td>
<td>Project addresses practical implications of study findings including how they will be shared with others. Attempts to discuss threats to validity, but does so superficially and/or fails to offer antidotes. Does not consistently support</td>
<td>Project addresses theoretical/practical implications of study findings including how they will be shared with others. Highlights threats to validity, reporting on how they were addressed. Supports assertions/interpretations using sound arguments consistent with study findings. Does not describe recommendations for future research, or how results will be applied.</td>
<td>Project includes evaluation of the study's strengths and weaknesses. Addresses theoretical/practical implications of study findings including how they will be shared with others. Highlights threats to validity, reporting on how they were addressed. Supports assertions/interpretations using sound arguments consistent with study findings. Describes</td>
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<td>assertions or interpretations using sound arguments consistent with study findings. Does not describe recommendations for future research, or how results will be applied in practice.</td>
<td>recommendations for future research, and how results will be applied in the practice.</td>
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Include a complete list of references in APA format. Append all appropriate materials, including, if relevant, any questionnaires, inventories, assessments, sample student work, etc. Include at least one example of each tool you use—it’s ideal to include one blank version and one version completed by one of your research subjects. In addition, follow these general guidelines:

- The model for your study report is not a masters thesis nor traditional class research paper, but rather an article prepared for submission to a journal that focuses more on practice than theory.
- You may find it helpful to select a journal whose research emphasis and readership match your research topic and follow its manuscript submission criteria.
- It is expected that the entire project will be described in a 25-30 page paper; please do not exceed the 30-page limit.
- Write in the past tense as much as it makes sense to do so.
- Your paper does not have to be anonymous; you can include names, as this is an internal document and will not be shared anywhere outside of our class.
- Be sure to make a personal and professional connection to your topic and project.
- Citations are not necessary in the introduction.
- Feel free to revise your questions based on data, to make these questions more focused.

Consider the following questions as you draft your references and appendices and consider the overall writing quality of your paper:

1) Did you follow the APA style for the report for a running head, page numbering, references, citations, and the appendix?
2) Does the report include a title page with project title, author’s name, and author’s professional affiliation?
3) Are references current and from different sources?
4) Are all references cited in the research report included in the references? Have you provided a complete reference list of all print and non-print (Internet) references?
5) Is the report coherent, concise, and well structured with a clear purpose?
6) Is the report grammatically correct with proper usage of language?
7) Does the report have your distinctive focus and voice? Have you used professional language (i.e., no jargon)? Have you written in an accessible style and presentation?
<table>
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<tr>
<th>References, Appendices, Writing Styles, Mechanics, and General Notes</th>
<th>Does not meet expectations 1</th>
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<td>Paper is so brief, incomplete, or off-topic that any reasonably accurate assessment is impossible.</td>
<td>Paper falls short of accepted standards for master’s level composition. Drafting errors and error patterns are widespread. Voice, verb tense, and writing style vary from section to section. Technical terms are used incorrectly and/or imprecisely, reflecting only a rudimentary understanding of the underlying concepts. Text is formulaic, relying heavily on paraphrases and “borrowed” materials not formally cited. Transitions are weak, contributing to an apparent lack of direction. Paper does not adhere to formatting specifications provided in course text and materials. Citations and references page do not follow APA style.</td>
<td>Paper is well written with few notable drafting errors. Voice, verb tense, and writing style are generally consistent with few exceptions that do not substantially diminish readability. Most technical terms are used correctly, reflecting adequate understanding of the underlying concepts. Text is original, but opinions and propositions are not consistently supported by logic and references to published research. Transitions do not connect sections seamlessly but do not substantially diminish readability. Paper does adhere to formatting specifications provided in course text and materials. Citations/references page do not follow APA style.</td>
<td>Paper is well written with no notable drafting errors. Voice, verb tense, and writing style are consistent throughout. Technical terms are used precisely and accurately, reflecting a firm understanding of underlying concepts. Text is original; opinions and propositions are supported by strong logic and formal references to published research. Sections are linked with unifying transitions, giving the report a clear sense of direction. Paper adheres to formatting specifications provided in course text and materials. Citations/references page follow APA style.</td>
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**Grading Scale for Research Project**

A+ 60 points: Substantially meets the project and report requirements. All criteria are addressed fully.
A 56-59 points: Meets the project and report requirements. Criteria adequately addressed.
A-  55-54- Meets some, but not all, of the project and report requirements. Weaknesses in addressing some of the criteria.
B-  53 points:
    - C- 53 points and below: Does not meet the project and report requirements. Weaknesses in addressing the majority of the criteria.

Please note that B- is not a passing grade
Observing, Awareness, & Acceptance: The Effects of Mindfulness Training on Potomac Middle School Eighth Graders

EDUC 675 Research in Secondary Education

Spring 2017
Abstract
This action research study explores how mindfulness training affects the mindfulness traits of observation skills, acting with awareness, and accepting without judgment within a population of eighth grade students attending Potomac Middle School in Dumfries, VA.

A sample of 10 eighth grade students were provided mindfulness instruction using the Mindful Schools Mindfulness Curriculum for Adolescents. The results of the training suggest that the curriculum training increased overall mindfulness, observation skills, acting with awareness, and accepting without judgment in 8 of the 10 sample students. Further research is required before generalizing the results beyond the sample.

Introduction
Context for the Study and Rationale for Study Execution

Adolescents are under tremendous pressure to succeed at home, at school, and in their communities. Within U.S. education, school systems have employed a number of measures designed to facilitate success by promoting academic mastery, curtailing problematic behavior, and developing social & civic responsibility. This context of this study emerged from two personal questions regarding these measures. The first, “Are current methods utilized within the U.S. education system providing adolescent students the foundational tools necessary to succeed at school and, more importantly, in their personal lives?” The second, “What foundational tool has a high probability of assisting adolescents in developing skills promoting success that I can personally affect?”

The answer to those questions pointed me towards mindfulness, a practice commonly defined by its founder, John Kabat-Zinn, as “awareness that arises through paying attention, on purpose, in the present moment, non-judgmentally” (as cited in Baer,
EFFECT OF MINDFULNESS TRAINING AT POTOMAC MIDDLE 2003) and one that I follow daily in my personal life. In the past decade, educators have increasingly turned to mindfulness as a tool for developing skills such as observing, acting with awareness, and accepting without judgment because these proficiencies have tremendous potential to assist in developing academic, behavioral, social, and civic success.

Purpose of Study

The primary purpose of this action research study is to determine the effect of mindfulness training on observation skills, acting with awareness, and accepting without judgment on eighth grade students attending Potomac Middle School in Dumfries, Virginia. Observation, awareness, and acceptance are not only critical aspects of mindfulness, but address the larger issue of what foundational skills can be accentuated within a school for educational, personal, and social success.

The overarching purpose of this action research study is to further validate the need for intervention programs such as mindfulness within U.S. public education. I believe there is a lack of understanding amongst educators that students require foundational skills such as observation, awareness, and acceptance to achieve success not only in school but also in their personal lives. To illustrate just one example of this point, parents, teachers, and peers typically inform students that success is measured by high academic achievement. Tips such as “study hard,” “focus,” and “apply yourself” are commonly offered, but these points do not address the intrinsic strategies required to succeed. Students should not be expected to inherently know these traits; they must be taught. Mindfulness attempts to develop and nurture these strategies.
Setting and School Demographics

The study was conducted at Potomac Middle School in Dumfries, VA, within Prince William County. The selection of this school was due primarily to the openness of administrative staff to allowing mindfulness training, a program not typically utilized within any district-approved school curriculum, and my desire to conduct the study with adolescent students based upon my familiarity with the pedagogical distinctions associated with this age group.

Within the 2016 – 2017 school year, 47.7% of students were classified at economically disadvantaged (which VDOE Student Records Data Definitions (2009) defines as a student who is eligible for free or reduced meals, receives Temporary Assistance for Needy Families (TANF), or is eligible for Medicaid) and 89.1% as a member of a racial/ethnic minority (Public Schools, 2016). These percentages are higher than the district averages of 36.1% economically disadvantaged and 68.1% racial/ethnic minority (2016). According to the Virginia Department of Education (2017), the 2016 Fall student population was 1,190, with 402 students enrolled in the eighth grade population. Within the eighth grade, the population used for this study, the racial/ethnic demographics were 52% Black, 27% Hispanic, 11% White, 7% Asian, 3% two or more races, 0.5% Native American, & 0.2% Pacific Islander. Eighth grade gender was divided almost evenly with 51% male and 49% female (2017).

These demographics indicate that students are predominantly members of an ethnic/racial minority and nearly 1 of every 2 come from economically
disadvantaged households. Within the eighth grade, a majority of students are Black and there are slightly more males than females.

Central Research Question

The research question guiding this study was the following:

How does mindfulness training affect observation skills, acting with awareness, and accepting without judgment for eighth grade students at Potomac Middle School in Dumfries, Virginia?

Mindfulness training was chosen as the intervention technique due to my personal practice of mindfulness and strong belief in its ability to provide the foundational skills required for students to achieve success at school and in their personal lives.

Observation, awareness, and acceptance were chosen for measurement because they represent key independent variables in determining an individual’s degree of mindfulness and are also the three primary mindfulness components measured by the quantitative Child and Adolescent Mindfulness Measure (CAMM) survey used in this study (see Appendix A). The scope of the question was restricted specifically to eighth grade students at Potomac Middle School because the estimated number of participants would not warrant generalization beyond the school and grade level providing the sample.

Literature Review

How Mindfulness Evolved To Assist Adolescents

The framework for implementing this mindfulness study for adolescent students initially emerged from research measuring its effectiveness with adults. Until this decade, most mindfulness research and programs focused on clinical and non-clinical adult populations (Burke, 2009). Numerous mindfulness studies suggested positive
neurological, physiological, cognitive, affective, and behavioral outcomes with adults (Hoffman, Sawyer, Witt, & Oh, 2010). The results of these studies led to a steady increase in adult mindfulness interventions in hospitals, prisons, and business, while expanding its use to promote self-help and personal well-being programs (Williams & Kabat-Zinn, 2011). Based upon proliferation of these interventions in a wide-array of professions and circumstances, mindfulness research in this decade shifted to adapt the lessons gathered from adult research to children and adolescents (Greco & Hayes, 2008).

This shift to understanding the effect of mindfulness in children and adolescents was supported by neuroscience research and educational psychology initiatives seeking to understand the relationship between cognition & affective self-regulation, improving social-emotional resiliencies, decreasing behavioral problems, and increasing academic outcomes (Tang, Yang, Leve, & Harold, 2012). Because schools are institutions that provide tools beyond content instruction, educators are increasingly looking at intervention techniques such as mindfulness to promote personal development and well-being (Zenner, Hermleben-Jurz, & Walach, 2014).

**The Benefits of Mindfulness for Adolescents**

Numerous studies have suggested the benefits of mindfulness for adolescents. It has been shown in some cases to reduce stress, improve self-confidence, increase attention, and promote self-esteem (Schonert-Reichl, 2010). It also may enhance cognitive functioning, boost academic performance, and positively affect holistic development (Shapiro, Brown, & Austin, 2011). These benefits are important in adolescent development because they can positively impact a child’s school experience and affect personal well-being throughout their lives (Rempel, 2012).
The Benefits of Mindfulness Are Not Without Question

Regardless of the volumes of research suggesting the advantageous aspects of mindfulness, it should not be considered a panacea for the physiological, psychological, behavioral, and social problems affecting adults or adolescents. (Semple, Droutman, & Reid, 2017). Individuals with personality disorders, psychosis, severe depression, or traumatic stress may not benefit from mindfulness interventions (Shapiro & Carlson, 2009). Additionally, a meta-analysis study of mindfulness studies for all age groups suggests the evidence base for most of the benefits of mindfulness remains limited and inconclusive (2017). The same study, however, concludes that sound, scientific research may expand upon what contexts mindfulness can be realistically utilized (2017).

Strengths and Limitations of the Mindful School Mindfulness Curriculum Used for This Study

The mindfulness curriculum suggested for intervention in this study was developed by Mindful Schools to assist educators in developing their own personal mindfulness practice and teach mindfulness to their students (Semple, Droutman, & Reid, 2017). The focus of their curriculum is bringing mindfulness to children and adolescents to expand attention, promote self-regulation, and create empathy (Mindful Schools, 2017). Curriculum use requires 6-weeks of online training in Educator Essentials, a program that strongly emphasizes personal mindfulness practice in unison with providing instruction to children & adolescents, grades K-12 (2017).

A primary strength of the Mindful Schools curriculum, compared to other mindfulness instructional tools that are available for classroom use, is that a controlled, randomized trial indicated that 92% of teachers received personal benefits and 84% of
students suggested they would continue to practice mindfulness techniques in the future (Semple, Droutman, & Reid, 2017). Additionally, statistically significant improvements related to mindfulness attention, physical, and social metrics were found up to 3-months after the completion of the Mindful Schools curriculum (2017).

A significant limitation of the Mindful Schools curriculum is a lack of more than one rigorous, randomized controlled trial to determine implementation fidelity, threats to validity, and valid outcome measures (Semple, Droutman, & Reid, 2017). Another limitation is that findings from the research data collected by Mindful Schools have yet to be included in peer-reviewed journals (2017).

Gaps in Literature This Study Addresses

This study was designed primarily to address the limited amount of research validating whether the Mindful Schools Mindfulness Curriculum for Adolescents, Grades 6 -12, improves the mindfulness traits of organization skills, acting with awareness, and accepting without judgment (the central research question of this study). Only one controlled trial was conducted using this curriculum and an analysis of the program by a 2017 meta-analysis study suggested more trials were needed to provide strong evidence of its generalized effectiveness in school settings (Semple, Droutman, & Reid, 2017). This study provides additional research into the curriculum’s effectiveness in improving mindfulness for adolescents.

Methods

Restatement of the Purpose of This Study

As previously stated, the primary purpose of this action research study is to determine the effect of mindfulness training on observation skills, acting with awareness,
The overarching purpose is further validation for the need of intervention programs such as mindfulness within U.S. public education.

**Demographics of the Sample**

The sample for this study was 10 eighth grade students attending Potomac Middle School (see Table 1). These students were representative of the eighth grade population. The ethnic/racial composition of the sample were 70% Black and 30% Hispanic. The sample is generally representative of the eighth grade population as a whole, with the noticeable absence of any additional ethnic/racial group besides Black and Hispanic at the sample level. For gender, 80% of participants were female and 20% male. This gender disparity is not indicative of the population; however, it does align with other mindfulness studies that found females are more likely to participate in voluntary mindfulness interventions than males (Howells, Ivtzan, & Eiroa-Orsoa, 2016).

For age, 80% of students were 14 years old and 20% of students 13 years old. These demographics indicate that the sample was comprised primarily of Black, female, 14 year old students.

**Table 1**

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<tr>
<th>Sample Demographics</th>
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<td><strong>Gender</strong></td>
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<tr>
<td>Females</td>
<td>8</td>
<td>80%</td>
</tr>
<tr>
<td>Males</td>
<td>2</td>
<td>20%</td>
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<td><strong>Race / Ethnicity</strong></td>
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<td></td>
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<tr>
<td>Black</td>
<td>7</td>
<td>70%</td>
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<tr>
<td>Hispanic</td>
<td>3</td>
<td>30%</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>8</td>
<td>80%</td>
</tr>
<tr>
<td>13</td>
<td>2</td>
<td>20%</td>
</tr>
</tbody>
</table>
Ethical Issues Raised and How They Were Addressed

Several ethical issues were addressed as part of this action research study. I met with the principal of Potomac Middle prior to implementing the study to ensure my study conformed with all district and school policies & procedures pertaining to action research implementation. All research was conducted in collaboration with the professor overseeing this thesis project and the teacher in whose class the study took place to ensure the methodology and conduct of the study remained transparent and reviewable. A detailed overview of the study was provided to each participating student and parent/legal-guardian of the student (through a Parent-Legal Guardian Consent Form that was signed & returned prior to a student being allowed to participate) establishing informed consent of participants, the voluntary nature of participating, and the anonymity & confidentiality of the data collected.

Explanation, Justification, and Appropriateness of Study Design

This study used an explanatory sequential mixed methods design. This design is the optimal choice when implementing a study beginning with quantitative research followed by quantitative research to explain the initial quantitative results (Creswell, 2014). The structure of this study is the collection of quantitative survey data followed by qualitative field observation and exit interview data, making this design an ideal choice, particularly when unexpected results arise from quantitative data from the initial phase of data collection (Ivankova, Creswell, & Stick, 2006). The flexibility of using quantitative survey data to inform and improve upon the qualitative design of field observations and interview questions assists in improving the reliability and validity of study findings (McBride, 2017).
Data Collection Timeline and Procedures

This study is designed with three distinct phases correlating longitudinally with mindfulness training implementation (see Table 2) (McBride, 2017). Phase 1 (pre-training) constituted initial quantitative survey data collection through use of the Child Acceptance and Mindfulness Measure (CAMM) survey. This phase established a pre-training baseline to determine the effectiveness of mindfulness training on answering the central research question.

Phase 2 (during training) constituted qualitative data collection in the form of field observations and consisted of all mindfulness training sessions comprising the action research intervention required for this study. Training occurred for nine days, averaging 30 – 45 minutes per daily session. Students received two lessons per day for a total of 18 mindfulness lessons. The Mindful Schools Mindfulness Curriculum for Adolescents, grades 6 – 12, provided the framework for each lesson.

Phase 3 (post-training) constituted quantitative CAMM survey data collection and qualitative exit interviews. Exit interviews were conducted with three students determined during Phase 2 (during training) field observations to represent a range of mindfulness development (high, moderate, and low). This data was useful in interpreting the quantitative survey results collected during Phase 1 (pre-training). Comparison of Phase 1 (pre-training) & Phase 3 (post-training) surveys was essential to determining whether the mindfulness intervention employed had a measureable effect on observation, awareness, and acceptance skills tied to the central research question.
Table 2

<table>
<thead>
<tr>
<th>Data Collection Phases &amp; Data Types Collected</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PHASE 1 (Pre-Training)</strong></td>
</tr>
<tr>
<td>Quantitative</td>
</tr>
<tr>
<td>Qualitative</td>
</tr>
<tr>
<td>CAMM Survey</td>
</tr>
<tr>
<td><strong>PHASE 2 (During Training)</strong></td>
</tr>
<tr>
<td>Quantitative</td>
</tr>
<tr>
<td>Qualitative</td>
</tr>
<tr>
<td>Field Observations</td>
</tr>
<tr>
<td><strong>PHASE 3 (Post-Training)</strong></td>
</tr>
<tr>
<td>Quantitative</td>
</tr>
<tr>
<td>Qualitative</td>
</tr>
<tr>
<td>CAMM Survey</td>
</tr>
<tr>
<td>Exit Interviews</td>
</tr>
</tbody>
</table>

**Data Analysis Plan for Triangulation**

The use of surveys, observations, and interviews was essential to meeting the requirement of triangulating data collection and analysis. Data analysis is aligned with procedures suggested by Ivankova, Creswell, & Stick (2006) for an explanatory sequential mixed methods design. This design was modified for the inclusion of additional quantitative data collection following the qualitative phase during Phase 3 (post-training).

The priority of the analysis approach was quantitative, with emphasis placed upon the CAMM survey results in Phase 1 (pre-training) and Phase 3 (post-training). Of note, the qualitative field observation data gathered in Phase 2 (during training) was instrumental in determining which three students would be selected for inclusion in the qualitative exit interview data collection. Data integration occurred concurrently across all phases, with emphasis on the quantitative comparison between the pre- and post-training CAMM surveys conducted in Phase 3 (post-training).
Collection of Quantitative Pre-Training Survey Data

Quantitative Phase 1 (pre-training) from the CAMM survey was combined with demographic variables to provide descriptive statistics concerning the sample. This information was used to determine strategies on refining field observation techniques and subsequent interview protocols in Phase 2 (during training) and Phase 3 (post-training) (McBride, 2017).

Collection of Qualitative Field Observations and Interview Data

Phase 2 (during training) quantitative data was collected through field observations and informal participant interviews. These instruments were grounded in the quantitative survey information gathered during Phase 1 (pre-training) and combined with interviews & observations to determine categories & themes affecting subsequent data collection throughout Phase 2 (during training) and Phase 3 (post-training) (McBride, 2017). Prior to using the interview protocol on the sample, a pilot test was conducted on three participants purposefully selected the quantitative data analysis gathered during Phase 1 (pre-training) as most representative of the sample demographic (2017). The test refined three of the exit interview questions (questions 2 through 4) (see Appendix B) to be more representative of the mindfulness skills of observation, awareness, and acceptance posed in the central research question.

Collection of Quantitative Post-Training Survey Data

Post-training CAMM survey data from Phase 3 (post-training) was collected and analyzed using the statistical averaging techniques employed during Phase 1 (pre-training) (McBride, 2017).
Integration of Quantitative and Qualitative Data

All quantitative and qualitative data collected throughout the study was combined for interpretation and explanation (McBride, 2017). The emphasis was identification of patterns emerging from the data, the implications of the findings in relation to the central question of the study, and how the findings influence future research in the field of mindfulness (2017).

Data Collection and Analytical Sampling Tools

Data collection instruments for this study included quantitative data collected through the CAMM survey and qualitative data collected through field observations and individual post-training exit interviews. Each of these instruments was designed to provide information regarding how the independent and dependent variables affect the central research question of the study.

Child Acceptance and Mindfulness Measure (CAMM) Survey

The mindfulness traits of observation, awareness, and acceptance were measured using the Child Acceptance and Mindfulness Measure (CAMM) survey (see Appendix A). It is composed of 10 questions using a reverse-scored psychometric scale ranging from 0 (Never True) to 4 (Always True) (McBride, 2017). Increases in scores corresponded to a decreasing level of mindfulness (2017).

The CAMM survey was chosen as the primary instrument based upon its wide use in other mindfulness studies and its repeated positive endorsement as a valid instrument in determining mindfulness aptitude for adolescents in peer-reviewed scholarly journals (Greco, Baer, & Smith, 2011; Kuby, McLean, & Allen, 2015). It was created in 2011 to address the lack of valid instruments to measure mindfulness in adolescents (McBride,
Prior to the CAMM, most instruments measuring mindfulness focused primarily on adults. A valid instrument specifically designed and worded for the adolescent population became a necessity as interest expanded in including mindfulness training within the education field. The CAMM survey’s high validity makes it the ideal instrument for this study.

**Interview Protocol**

The interview protocol was designed to provide qualitative information to assist researchers in determining whether students exhibited the mindfulness traits of observation, awareness, and acceptance raised by the central question of this study. Interview language was tailored to middle school adolescents. Asking questions in the interview format provided relevant and important data in establishing answers that decreased threats to validity and assisted in developing potential future research.

**Statistical Tests Utilized for Study**

This study used averaging as the only primary statistical testing method. Information consisting of ethnic/racial composition and gender for both the population and sample were averaged to provide a clearer picture of demographic composition. Age was also recorded for sample demographics but was unavailable from the data gathered on the population. Additionally, pre- and post-training scores from all sample student’s CAMM surveys were collected and averaged to assist in answering the study’s central question of whether mindfulness training affects observation skills, acting with awareness, and accepting without judgment.
Results and Findings

Answering the Central Research Question

The central research question guiding this study asked how mindfulness training affected observation skills, acting with awareness, and accepting without judgment for eighth grade students at Potomac Middle School in Dumfries, Virginia. The results of the study suggest that mindfulness training increased observation skills, increased acting with awareness, and increased accepting without judgment for a majority of students who participated in the study; however, due to the small sample size of the participants (10 students), generalization to the population (all eighth grade students at Potomac Middle School) is unwarranted.

Sample Selection Procedures That Influenced Findings

Sample selection was based on the willingness of a teacher at Potomac Middle to allow me to teach mindfulness to students attending her 60-minute Independent Study period (Monday through Friday). In this period, 25 students were provided the opportunity to volunteer for inclusion in the study. Of the 25 solicited, 14 returned the Parental-Legal Guardian Consent Form required for study participation. Of the 14 original students who began the study, 4 were not included in the analysis conducted for findings and results. Of the 4 not included, 1 opted out of training on the first day, 1 was dropped due to missing over 50% of training due to suspensions, 1 for missing over 50% of the training due to absences, and 1 for not completing the post-training survey. The remaining 10 students attended over 50% of training and completed the pre- and post-training CAMM surveys required to quantitatively measure changes in observation, awareness, and acceptance tied to the study’s central research question.
Findings From Quantitative CAMM Survey Data Collection

The Phase 1 (pre-training) quantitative CAMM Survey results indicated an average score of 18. As the CAMM is reversed scored, a score of 0 indicates the highest level of mindfulness while a score of 40 indicates the lowest. An average score of 18 suggests that the sample, as a whole, had a moderate level of mindfulness prior to initiating training. This score was used as a baseline to measure subsequent changes in mindfulness after training was concluded in Phase 3 (post-training).

The Phase 3 (post-training) quantitative CAMM Survey results indicated an average score of 15. A comparison of the Phase 1 (post-training) average score of 18 to the Phase 3 (pre-training) score of 15 indicates that mindfulness increased slightly, a decrease of 3 points, after students participated in mindfulness training. The increase in mindfulness measured quantitatively through the pre- and post- training survey results suggests that mindfulness training is the primary cause impacting this change; however, without a more robust statistical analysis of the variables affecting change, this conclusion is considered only an educated deduction.

Findings From Qualitative Field Observation Data Collection

Qualitative field observation data collected during Phase 2 (during training) suggest an increase in mindfulness for a majority of students involved in the study. Beginning on Day 2 of training, after the definition and core principles of mindfulness were discussed on Day 1, I would ask students how mindfulness was affecting their lives at the start of each session. Some of the more pertinent answers I received were, “I don’t want to hit my brother anymore,” “I don’t cuss at teachers who cuss at me,” and “I focus on what is going on around me without getting all wrapped up in it.” The content and
tone of these responses suggest that students were successfully integrating the lessons of mindfulness.

Field observation notes were recorded at the completion of each day and discussed with the teacher in whose class training occurred to ensure accuracy and note themes guiding subsequent instruction. The primary themes that emerged were the need for more student conversations and relocating instruction to a quieter environment. I noted early in training that the design of the Mindful Schools curriculum heavily relied on the lecture method of instruction. This method did not enable meaningful dialogue exchanges between students and I subsequently altered instruction after Day 3 to increase the number of conversations between students. The resulting dialogue anecdotally facilitated a deeper understanding by the students of mindfulness principles. Additionally, instruction was moved from the classroom to the courtyard beside the classroom for Days 3 through 5 based on my assumption that being outdoors might create a more relaxing learning environment with less ambient noise. This decision did not have the intended effect as students complained of being too cold, too hot, and frequently were distracted by the compulsion to blow dandelion seeds on each other! Ultimately, training was moved to the library for Days 6 through 9. The library proved to be the ideal location for training due to its optimal temperature, lack of distractive flora, and relative silence.

**Findings from Qualitative Exit Interview Results**

Qualitative data collected during Phase 3 (post-training) exit interviews suggest an increase in mindfulness for the three students interviewed. These students were selected, based on their CAMM survey scores & my field observations, as most
representative of having high, moderate, and low levels of mindfulness. The interview consisted of five questions relating to mindfulness, three of which (questions 2 through 4) tied specifically to the central research question regarding observation skills, acting with awareness, and accepting without judgment (see Appendix B).

The first question asked students to define what the term mindfulness meant to them. Their answers included, “It means to center myself,” “Being in the right mindset,” and “Being aware of what’s around you.” Each student was able to articulate a personal answer aligned with the mindfulness principles taught throughout the training.

Questions 2 through 4 asked students to specifically articulate how mindfulness training affected their observation skills, acting with awareness, and accepting without judgment, the variables measured in the central research question. The student perceived as having a lower degree of mindfulness had a difficult time forming an answer to these questions, for example stating, “It made me look at things more better,” when asked about observation skills. The answers provided by the student perceived as having moderate mindfulness were more detailed. When asked about accepting without judgment, she replied, “It shows you not to judge someone because you don’t know what is going on with them.” The student with the highest perceived level of mindfulness provided the most descriptive answers. When asked about how mindfulness training helped her act with awareness, she articulated, “It made me a lot more aware of the little things that I do. Things are clearer and easier to focus on. When I am in class, I can more easily determine emerging patterns.”

Overall, the exit interview answers aligned with the central research question suggest that students perceived as being more mindful are better able to articulate the
effect of mindfulness training. However, this deduction seems spurious due to small number of interviewees and the realization that a host of unidentified factors, such as cognitive ability, language aptitude, & mood during the interview to name a few, could greatly affect their answers.

The final exit interview question asked students to make recommendations on how to improve future mindfulness training. There answers aligned with themes that emerged during field observations, such as, “We should have more discussions on what is going on in our lives,” and, “Try to have training in different places.” The answer I found most endearing was, “I don’t really have any recommendations. You did a good job… for your first time.”

**Synthesis of Data Collection**

Synthesis of quantitative CAMM survey results, qualitative field observations, and qualitative exit interviews suggest that overall mindfulness increased for a majority of students who participated in the study and, in regards to the central research question, mindfulness training increased observation skills, increased acting with awareness, and increased accepting without judgment. As previously discussed, the small sample size suggests the results should only be interpreted in the context of the students involved in the sample and not representative of the eighth grade population originally posited in the central research question. As the emphasis of this study relies on quantitative data because of its empirical nature, the subsequent analysis delineated by ethnic/racial profile and gender references focuses primarily on CAMM survey results, with anecdotal input provided by field observations and, to a smaller extent, exit interviews.
Results Delineated by Ethnic/Racial Profile

The results for Black students who participated in the study (70% of the sample) suggest a moderate increase in overall mindfulness, observation skills, acting with awareness, and accepting without judgment (see Table 3). The average increase was -3 points when measuring differences between pre- and post-training CAMM survey results. Of note, the two students who demonstrated less mindfulness and the one student who showed no change were Black. The specific reasons for mindfulness not improving in three students are speculative, but field observations and the one exit interview conducted with a Black student whose score indicate less mindfulness suggest that the overall goal of mindfulness improvement did not resonate with their personal goals.

The results for Hispanic students who participated in the study (30% of the sample) suggest a moderate increase in overall mindfulness, observation skills, acting with awareness, and accepting without judgment (see Table 4). The average increase was -4 points when measuring differences between pre- and post-training CAMM survey results. These results, supported by field observations and two of the exit interviews, indicate that all Hispanic students benefitted from the training.

Results Delineated by Gender

The results for female students who participated in the study (80% of the sample) suggest a moderate increase in overall mindfulness, observation skills, acting with awareness, and accepting without judgment (see Table 5). The average increase was -5 points when measuring differences between pre- and post-training CAMM survey results. These results, supported by field observations and two of the exit interviews, indicate that 9 of the 10 of the female students benefitted from the training. The results
for the one female student that showed a decrease in mindfulness, as indicated by the CAMM survey, field observations, and one exit interview, is most likely due to a lack of interest in learning and utilizing mindfulness principles.

Table 3

<table>
<thead>
<tr>
<th>Student ID #</th>
<th>Gender</th>
<th>Age</th>
<th>Ethnicity/Race</th>
<th>Pre-Training CAMM Score</th>
<th>Post-Training CAMM Score</th>
<th>Change Between Pre- &amp; Post-Training CAMM Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
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<td>13</td>
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<td>11</td>
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<td>5</td>
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<td>4</td>
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</tr>
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<td>F</td>
<td>14</td>
<td>Black</td>
<td>14</td>
<td>5</td>
<td>-9</td>
</tr>
<tr>
<td>8</td>
<td>M</td>
<td>13</td>
<td>Black</td>
<td>17</td>
<td>21</td>
<td>4</td>
</tr>
<tr>
<td>10</td>
<td>F</td>
<td>14</td>
<td>Black</td>
<td>17</td>
<td>16</td>
<td>-1</td>
</tr>
<tr>
<td>12</td>
<td>M</td>
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<td>Black</td>
<td>23</td>
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</tr>
<tr>
<td>14</td>
<td>F</td>
<td>14</td>
<td>Black</td>
<td>32</td>
<td>18</td>
<td>-14</td>
</tr>
<tr>
<td>Total # of Participants</td>
<td>Predominant Gender</td>
<td>Average Age</td>
<td>Predominant Ethnicity/Race</td>
<td>Average Score</td>
<td>Average Score</td>
<td>Average Score Change</td>
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<td>14</td>
<td>Black</td>
<td>18</td>
<td>15</td>
<td>-3</td>
</tr>
</tbody>
</table>

Note & Color Coding Key

The CAMM survey is reversed scored. The lower the score, the higher the mindfulness.

- Indicates an INCREASE in mindfulness after training
- Indicates NO change in mindfulness after training
- Indicates a DECREASE in mindfulness after training

The results for male students who participated in the study (20% of the sample) suggest no change or decreasing overall mindfulness, observation skills, acting with awareness, and accepting without judgment (see Table 6). The average decrease was +2 points when measuring differences between pre- and post-training CAMM survey results. These results, supported by field observations, indicate that the males who participated in the study did not benefit from participating in mindfulness training. A
A recent study concerning mindfulness gender differences in adolescents found that females have higher self-reported tendencies to be mindful than males (Kuby, McLean, & Allen, 2015). This finding may support why the males in my study showed decreasing mindfulness. However, the small sample of only 2 male students makes analysis of the cause extremely problematic.

Table 4

<table>
<thead>
<tr>
<th>Student ID #</th>
<th>Gender</th>
<th>Age</th>
<th>Ethnicity/Race</th>
<th>Pre-Training CAMM Score</th>
<th>Post-Training CAMM Score</th>
<th>Change Between Pre- &amp; Post-Training CAMM Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
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<td>F</td>
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<td>Hispanic</td>
<td>16</td>
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<td>-4</td>
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<td>27</td>
<td>25</td>
<td>-2</td>
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<table>
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<tr>
<th>Total # of Participants</th>
<th>Predominant Gender</th>
<th>Average Age</th>
<th>Predominant Ethnicity/Race</th>
<th>Average Score</th>
<th>Average Score</th>
<th>Average Score Change</th>
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</thead>
<tbody>
<tr>
<td>3</td>
<td>F</td>
<td>14</td>
<td>Hispanic</td>
<td>18</td>
<td>14</td>
<td>-4</td>
</tr>
</tbody>
</table>

Note & Color Coding Key
The CAMM survey is reversed scored. The lower the score, the higher the mindfulness. Green indicates an INCREASE in mindfulness after training.

Results Applicable to Entire Sample (Tying It All Together)

Aggregate data collected from CAMM surveys (see Table 7), field observations, and exit interviews all suggest that the mindfulness training provided for this study, using the Mindful Schools Mindfulness Curriculum for Adolescents, did increase overall mindfulness, observations skills, acting with awareness, and accepting without judgment in a majority of students. When comparing students by ethnic/racial differences, Blacks and Hispanics both showed moderate increases in mindfulness as measured by
differences between pre- and post- training CAMM survey scores, -3 and -4 points respectively.

Table 5

<table>
<thead>
<tr>
<th>Student ID #</th>
<th>Gender</th>
<th>Age</th>
<th>Ethnicity/Race</th>
<th>Pre-Training CAMM Score</th>
<th>Post-Training CAMM Score</th>
<th>Change Between Pre- &amp; Post-Training CAMM Scores</th>
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</thead>
<tbody>
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<tr>
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<td>32</td>
<td>18</td>
<td>-14</td>
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<tr>
<th>Total # of Participants</th>
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<th>Average Score</th>
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<td>13</td>
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</tbody>
</table>

**Note & Color Coding Key**

- The CAMM survey is reversed scored. The lower the score, the higher the mindfulness.
- Green indicates an INCREASE in mindfulness after training
- Red indicates a DECREASE in mindfulness after training

This finding suggests that differences in ethnicity & race are not predictive measures of mindfulness. When comparing students by gender, females were much more likely to show increased mindfulness, -5 points, than males, +2 points. This finding suggests that gender may be a predictive measure of mindfulness. The small sample size (N=10) suggests that all findings and recommendations associated with this study only apply to the sample itself and not the larger population of eighth grade students at Chisholm.
The small sample size also negates the use of statistical analyses that would address the study’s validity and reliability.

Table 6

<table>
<thead>
<tr>
<th>Student ID #</th>
<th>Gender</th>
<th>Age</th>
<th>Ethnicity/Race</th>
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<tbody>
<tr>
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<th>Average Score</th>
<th>Average Score</th>
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</tr>
</tbody>
</table>

**Note & Color Coding Key**

The CAMM survey is reversed scored. The lower the score, the higher the mindfulness.

- Green indicates NO change in mindfulness after training
- Red indicates a DECREASE in mindfulness after training

**Surprises in Findings**

The only surprise noted in the findings was the lack of increased mindfulness for male participants. I believe, however, this result is largely due to the small sample size (N=2). The addition of more males to the sample would most likely change this result and indicate an overall increase in mindfulness for this gender group.

**No Plausible Alternative Explanations for Findings**

The most plausible explanation for the findings is that the mindfulness training provided over the course of the study was responsible for increases in overall mindfulness, observation skills, acting with awareness, and accepting without judgment.
This assertion is based on the strength of the link between the quantitative data collected using the CAMM survey and the specificity of the central research question.

Table 7

<table>
<thead>
<tr>
<th>Student ID #</th>
<th>Gender</th>
<th>Age</th>
<th>Ethnicity/Race</th>
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<td>14</td>
<td>7</td>
<td>-7</td>
</tr>
<tr>
<td>5</td>
<td>F</td>
<td>14</td>
<td>Black</td>
<td>14</td>
<td>5</td>
<td>-9</td>
</tr>
<tr>
<td>6</td>
<td>F</td>
<td>14</td>
<td>Hispanic</td>
<td>16</td>
<td>12</td>
<td>-4</td>
</tr>
<tr>
<td>8</td>
<td>M</td>
<td>13</td>
<td>Black</td>
<td>17</td>
<td>21</td>
<td>4</td>
</tr>
<tr>
<td>10</td>
<td>F</td>
<td>14</td>
<td>Black</td>
<td>17</td>
<td>16</td>
<td>-1</td>
</tr>
<tr>
<td>12</td>
<td>M</td>
<td>14</td>
<td>Black</td>
<td>23</td>
<td>23</td>
<td>0</td>
</tr>
<tr>
<td>13</td>
<td>F</td>
<td>14</td>
<td>Hispanic</td>
<td>27</td>
<td>25</td>
<td>-2</td>
</tr>
<tr>
<td>14</td>
<td>F</td>
<td>14</td>
<td>Black</td>
<td>32</td>
<td>18</td>
<td>-14</td>
</tr>
</tbody>
</table>

Total # of Participants: 10

<table>
<thead>
<tr>
<th>Predominant Gender</th>
<th>Average Age</th>
<th>Predominant Ethnicity/Race</th>
<th>Average Score</th>
<th>Average Score</th>
<th>Average Score Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>14</td>
<td>Black</td>
<td>18</td>
<td>15</td>
<td>-3</td>
</tr>
</tbody>
</table>

Note & Color Coding Key
The CAMM survey is reversed scored. The lower the score, the higher the mindfulness.
- Green indicates an INCREASE in mindfulness after training
- Yellow indicates NO change in mindfulness after training
- Red indicates a DECREASE in mindfulness after training

The CAMM is designed to measure only three traits of mindfulness and the central research question was worded to determine only the effects of the same three traits (observation skills, acting with awareness, and accepting without judgment). Regardless of the purposeful overlap in design between data collection and the question raised, it must be noted that correlation between any dependent and independent variables is not possible due to the small sample size and lack of more robust statistical analyses.
Discussion, Reflection, Implications, and Recommendations

Discussion

The findings suggest that mindfulness training is a useful tool, for some students, in increasing observations skills, acting with awareness, and accepting without judgment for adolescent students. If mindfulness training could provide another tool for educators to develop skills considered essential to influencing students’ success at school and their personal lives, as posited in the introduction of this study, then inclusion of such training warrants further exploration. However, the benefits of mindfulness are not universally accepted, particularly in the field of education. Research concerning its impact on adolescents and children continues to increase, but findings are mixed on its usefulness in promoting educational goals. As I experienced in attempting to initiate this study, some school administrators and teachers are willing to provide classroom time to explore mindfulness while others are skeptical its benefits outweigh the content that such training displaces.

Reflection

The findings of this study validate my belief that mindfulness is an important component in building the foundation skills required for adolescents to succeed. Increasing organizational skills, acting with awareness, and accepting without judgment can benefit students in handling the stressors experienced at school and in their personal lives. I plan to integrate mindfulness training into instruction when, and if, I have a classroom of my own.
Strengths of the Study

The strength of this study is its adherence to furthering research concerning the impact of mindfulness on adolescents and demonstrating the applicability of the Mindful Schools Mindfulness Curriculum for Adolescents. As previously discussed, mindfulness research has only focused on adolescents and children within the past decade. The recommendations for future research in most of the studies I reviewed indicated a dire need for quantitative mindfulness research specifically aimed at children and adolescents. This study addresses that request. Additionally, the Mindful Schools Mindfulness Curriculum has only one peer-reviewed meta-analysis study regarding its effectiveness in improving mindfulness in children and adolescents. The use of their curriculum for this study further validates its applicability in increasing the mindfulness traits of observation skills, acting with awareness, and accepting without judgment in adolescents.

Weakness of the Study

The primary weakness of this study is that the small sample size does not warrant significant statistical analysis and, therefore, does not promote generalization of the results beyond the sample. This lack of generalization additionally weakens the ability of establishing validity and reliability of the results beyond description of the sample.

Practical Implications of Findings

The findings suggest that use of the Mindful Schools Mindfulness Curriculum for Adolescents does increase the mindfulness traits of observation skills, acting with awareness, and promoting accepting without judgment in most of the students who received the training. However, the small sample size requires caution in applying these results to any group other than the students comprising the sample. Of note from the
findings is that while most of the sample students did show increased mindfulness, some did not. This result suggests that the mindfulness training conducted for the study is not a universal conduit for receiving, integrating, and expressing mindfulness principles. In sum, the mindfulness intervention used for this action research project shows potential for increasing the mindfulness traits of observation, awareness, and acceptance, but a larger sample would be required in future research to establish generalization, validity, and reliability.

Dissemination of Findings to Others

The findings from this research study will be provided to the principal of Potomac Middle School and the teacher who facilitated the training in her classroom with the expressed caveat that the results were only applicable to the students who participated in the study. Findings will also be made available to the lead instructors at Mindful Schools to provide further insight into how their curriculum affects the mindfulness principles of observation skills, acting with awareness, and accepting without judgment.

Threats to Validity

Several internal and external issues impacted the validity of study findings. These threats were identified to increase the likelihood that results are generalizable beyond the scope of the sample studied (Creswell, 2014). An examination of the most applicable internal and external threats to validity is useful in highlighting their overall impact on this study and implications on future research (McBride, 2017).

Internal Validity Threat: Randomization to Create Generalization

Internal validity threats are study procedures, treatments, or experiences that may impact the ability of researchers to infer results applicable to the population, i.e.,
generalization (Creswell, 2014). Generalization of results is a crucial factor in establishing the relevancy and validity of the study (McBride, 2017). The elements most applicable to the internal validity of this study were selection of participants predisposed to specific outcomes and diffusion of treatment (2017). Students with certain characteristics that are proportionally higher at the sample level (such as a high concentration of a particular ethnic/racial group or gender) may impact generalization of results to the study’s population (2017). A possible solution to this threat is random selection of participants to increase the likelihood of equal distribution of students with these characteristics (2017). However, the small sample size necessitated by finding a school and teacher willing to implement mindfulness training made randomization unfeasible thereby making statistical analyses required for validation and generalization unwarranted (2017).

**Internal Validity Threat: Diffusion of Treatment**

Students participating in the study may discuss the mindfulness training received influence the actions other students participating in the study (McBride, 2017). This threat was mitigated by communicating the intent of the study with students prior to training and asking each student to verbally agree not to discuss any answers to survey & interview questions received prior to study completion (2017).

**External Validity Threat: Applying Results Outside the Study**

Externals validity threats emerge when experimenters attempt to apply study results to people, settings, or situations outside the scope of the study, i.e., trying to generalize the results identified with the sample to the population or beyond (Creswell, 2014). This threat was mitigated by specifically stating in the findings that the sample
size not large enough for comparison to the population. Special consideration is given to understanding the characteristics of study participants to mitigate the factors influencing the ability to generalize study results (McBride, 2017).

**External Validity Threat: Generalizing Characteristics Beyond the Sample**

Students involved in the study may have characteristics too narrowly defined to reflect the population as a whole (McBride, 2017). This threat was mitigated by applying mindfulness characteristics (observation skills, acting with awareness, and accepting without judgment) representative of anyone, regardless of their background, engaged in mindfulness practice.

**Limitations**

This study was affected by three limitations that directly impacted the size of the sample, validity of the findings, and generalization of the results. First, the study was extremely difficult to implement. As a substitute teacher, I was required to find a school and teacher amenable to conducting mindfulness training. Navigating school administration bureaucratic requirements was extremely time consuming and, had I not found a principal and teacher willing to allow me implement the training, I would not have the time required to complete the mindfulness intervention due to the time constraints of finishing the study prior to the completion of EDUC 675 course. There was no mitigation for this limitation in real time. However, for subsequent mindfulness studies attempted within the Prince William County School District, I recommend sending email requests to all the principals within the district as soon as possible during the semester and immediately following up with a personal meeting with any that show even a modicum of interest in learning more about the benefits of mindfulness.
Second, the study was designed for only one researcher, limiting the sample size and possibility of generalizing the results (McBride, 2017). The researcher must be consistently available to collect all data and conduct training & interviews (2017). Lapses in researcher availability could severely impact study results (2017). This factor could be mitigated by the inclusion of additional researchers who are trained in data collection and training/interview processes (2017).

Third, this study requires an instructor certified in mindfulness training (McBride, 2017). This training is only offered through specific mindfulness programs and typically requires a minimum of six-weeks for certification (2017). This factor could be mitigated by a certified mindfulness instructor training teachers of the groups involved in the study in mindfulness instruction (2017). These teachers could then provide mindfulness instruction to their students with periodic oversight and guidance by the certified instructor (2017).

**Future Research**

Future research would benefit from increasing the sample size so that the number of participants is statistically significant and representative of the population. The addition of other schools in the district, and possibly beyond, would increase the validity of the study and promote generalization (McBride, 2017). Additionally, studies that include mindfulness curriculum beyond the one used for this study (Mindful Schools) may suggest more appropriate measures to increase observation, awareness, and acceptance skills.
References


Schonert-Reichl, K. A., & Lawlor, M. S. (2010). The effects of mindfulness-based education program on pre- and early adolescents’ well-being and social and


Virginia Department of Education. (2017). School Summaries by Ethnicity, Grade, &
Main&subRptName=Fallmembership

in schools – a systematic review and meta-analysis. *Frontiers in Psychology*,
5(603), 1-20. doi:10.3389/fpsyg.2014.00603
Appendix A

Child Acceptance and Mindfulness Measure (CAMM)

Name: _________________________________________________________________
Date: __________________________________________________________________
Teacher: _______________________________________________________________
Period: ___________________

* These questions describe how you think, how you feel, and what you do. Please read each sentence carefully and then circle the number that describes HOW OFTEN each sentence is TRUE for you. Pay attention to the descriptions above the numbers before you circle your answer.

<table>
<thead>
<tr>
<th>Child Acceptance and Mindfulness Measure (CAMM) Survey</th>
<th>Never True</th>
<th>Rarely True</th>
<th>Sometimes True</th>
<th>Often True</th>
<th>Always True</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I get upset with myself for having feelings that do not make sense.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>2. At school, I walk from class to class without noticing what I am doing</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>3. I keep myself busy so that I do not notice my thoughts or feelings.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>4. I tell myself that I should not feel the way that I am feeling.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>5. I push away thoughts that I do not like.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>6. It is hard for me to pay attention to only one thing at a time.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>7. I get upset with myself for having certain thoughts.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
8. I think about things that have happened in the past instead of thinking about things that are happening right now.  

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
</table>

9. I think that some of my feelings are bad and that I should not have them.  

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
</table>

10. I stop myself from having feelings that I do not like.  

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
</table>

* Note: Ruth Baer developed this version of the CAMM survey. See reference citation (Baer, R.) for further information.
Appendix B

Interview Protocol

Student Name: _________________________________________________________
Interviewer Name: _____________________________________________________
Date: _________________________________________________________________
Teacher’s Name: _______________________________________________________  
Period of Mindfulness Training: _____________

* Release form returned and signed? YES NO

Notes to student participating in the interview:

1. Thank you for participation in this mindfulness training study. Your input is very important to helping figure out how mindfulness training affects (acts upon) middle school students.

2. All of your answers are completely confidential (will not be shared without your permission) and will only be used in this study.

3. The interview has five major questions and should last 10 – 15 minutes.

Questions

1. What does the term “mindfulness” mean to you?

2. How has the mindfulness training you received for this study affected (acted upon) your observation skills?

3. How has the mindfulness training you received for this study affected (acted upon) your ability to be aware of what is going on around you in the present moment?

4. How has the mindfulness training you received for this study affected (acted upon) your ability to accept what is happening to you without judgment?

5. What recommendations would you make to improve this training in the future?
What the Plick Were You Thinking:
Shared Formative Assessments and Student Engagement

George Mason University
Abstract

Student engagement is affected by several psychological factors, including feelings of competence and autonomy. These factors can be bolstered by certain classroom activities and stifled by others. A study was conducted to discern how the Plickers instant-feedback response system can affect student accountability in shared formative assessments and engagement in an Honors Physics course. Data collected through video observations and student self-reports, as well as collected statements and teacher notes, are used to support conclusions. Findings weakly support the hypothesis that the Plickers platform could increase accountability and engagement. The author endorses and recommends use of Plickers, especially for checking student completion of assigned reading. Further research is recommended, particularly increased longitudinal data collection and more thorough planning of routines for implementation of Plickers.

Keywords: Engagement, Shared Assessment, Plickers
Rationale

When I was a high school student I was excited to take a course in Physics. The inner workings of the universe were always something that had intrigued me, and my prior courses in Chemistry served to further pique my interest in the topic. For me, Physics reveals the truth of many things and is a powerful set of tools for examining the world around me, making decisions, and revealing why some unexpected things happen. When I decided to become a teacher Physics was the obvious choice before me. However, now that I have students of my own I do not see the same passion in most of them. Many complain about any type of assignment or activity, and only really want to talk to friends or look at their cell phones. This low level of engagement leaves some of them lacking the skills and understandings necessary for academic achievement in my Honors Physics course, and I would like to find a way to foster at least some more engagement if I can’t reach their personal passions.

Community Context

The student subjects of this study attend a suburban public high school in Northern Virginia. Many students and parents in this region are quite competitive as pertains to college admissions. Much of Northern Virginia is populated with affluent, educated parents and high expectations are placed the students’ performance both among one another and in context of the college-bound body of students nationwide.

However, the region is also home to many immigrants due in part to its proximity to Washington DC. The region feeding this high school has in recent years seen a large influx of
Asian families, with Korea being the largest contributor. The school itself reports demographics of 38% White, 32% Asian, 17% Hispanic, 9% Black, and 4% Other\(^1\). It should be noted that the category of “white” includes students from regions around the eastern end of the Mediterranean such as Egypt and Turkey, and that this breakdown of four demographic types underrepresents the diversity of the school, which has students personally hailing from 84 different countries and more representing second-generation families.

The effects of English language development and differing cultural expectations between students and teachers occasionally causes confusion for both parties. The language portion is mostly a non-issue for students taking Honors-level courses, but the cultural differences crop up on a somewhat consistent basis. With pressure to excel coming from parents and colleges, the students sometimes feel great stress in their academic pursuits. The school has been a recipient of the Substance Abuse and Mental Health Services Administration’s Project AWARE grant for mental health services to be provided to students at risk for suicide.

**Research Questions**

The study seeks to answer these two questions: *How can instant feedback affect student engagement in my classroom?* and *How can instant feedback affect individual student accountability in formative assessments?* In order to show why these questions became my focus I will describe some of the classroom activities I have employed throughout this year and what challenges I have faced with each of them.

Lab activities are intended to constitute a significant amount of coursework for a high school Science course. While they can be fun and achieve high levels of engagement, they are

\(^1\) FCPS School Profiles April 23, 2017.
http://schoolprofiles.fcps.edu/schlprfl/?p=108;13:2334988199258481:::P0_CURRENT_SCHOOL_ID:410
time-consuming and unfortunately have been ineffective for student learning. I am sure to be at least partially culpable in this aspect due to my being a new teacher and still learning the quirks of the labs myself. Additionally, the room in which I teach is not a lab-science room. It is a small, windowless classroom that only barely fits the furniture necessary for 31 students, files, a computer cart, and desks for two teachers (I also have a team-taught course). This sends most lab activities out into the ill-controlled hallway setting, and inhibits my ability to seat the students in anything but tightly-spaced front-facing rows, which limits student discussions. Lab work also allows weaker students to lean on group members, masking their own levels of achievement.

Lectures are a staple of the modern classroom, but often lull the students to sleep or lead to otherwise disengaged behaviors. Some students have requested sessions of lecture with guided notes; this is a practice to which they are accustomed and in which they feel confident that they can glean the information they need to achieve good test scores. Unfortunately, Physics tests are rarely the kind of thing for which one can memorize information since a large emphasis is put on problem identification and solving. Taking of notes is sometimes necessary to get students in line with science community norms and accepted standards, but usually fails to give students practice in the *skills* that I expect them to demonstrate.

On the other hand, problem solving in its full glory is quite time-consuming for me to grade and even two such problems assigned to all students in my three sections (87 students) may take as long as three hours to mark with enough care to differentiate levels of achievement and enough detail to help students improve. While I have been doing this, it often means that I simply don’t have the time to get marks back to my students soon enough for the content to remain fresh in their minds. This dislocation between the work done and the mark received can leave the students confused about how to improve before the next assessment.
I have in the past assigned readings for homework with the expectation that students would arrive with questions and comments, ready to investigate the more confusing points of the reading, but what I found was that many students simply ignored the assignment and I was forced to go over even the simplest concepts. This wastes time and leaves the students with less practice or less clarification on the most difficult types of problems.

It is for these reasons that I began seeking a way to streamline the process of getting data from and giving feedback to, all my students at once: 1) to avoid the confusion that comes with group assignments of which students did what work, and be able to identify individual understanding; 2) to have a sense of their understanding immediately, rather than being forced to grade after class, so that I could make formative assessments and adjust my lesson to better hit the weak spots; 3) to provide a scaffold for students to recognize when they have misunderstood, a skill in which many of them are weak; and 4) to quickly confirm whether reading assignments had been done and encourage those who shirked to better meet expectations.

Perhaps most importantly, I also expected 5) to get more of my students engaged for all the above reasons, but from the students’ perspective: requiring each one to respond individually, elucidating their misconceptions, allowing them to more directly influence content covered, and holding them accountable on reading assignments.

The Study

After seeking advice from other teachers and reviewing literature pertaining to different technological options for collecting student responses and giving instant feedback, I chose to try the Plickers platform in my class. Plickers build on the concept of multiple-choice “clicker” response systems used in some university lecture halls to collect formative data on the class as a whole. In a traditional clicker system the response devices are either hard-wired in the lecture
hall or use a radio signal to communicate with the professor’s device. There are similar systems such as Kahoot freely available to classroom teachers which make use of the near-ubiquitous wireless internet devices which students bring to school. These usually require an app and/or a log-in for students to respond.

Plickers present several advantages over such a system in a classroom setting. Instead of requiring installation, crowding wireless internet bandwidth, or requiring students to log in, Plickers employ matrix barcodes printed on ordinary paper or matte-laminated cards. In each section of a course up to 63 students can be individually assigned a unique response card. To respond, students hold up the cards with their chosen answer at the top. The cards are designed with small print to make it difficult for students to discern one another’s answers. The teacher’s camera- and internet- capable device chooses questions, scans the cards, and reports to the Plickers website. The website can be used to display the question to students and confirm receipt of individual responses, as well as reveal the correct answer and the responses of the whole class or of individuals. Data is stored on the website and can be recalled later for entering grades.

My hypothesis was that introducing such a total-participation, instant-feedback platform to the class routine would increase the students’ awareness of and participation in their own formative assessments. Student engagement is also expected to increase as a by-product. These hypotheses are supported by the literature in review below. Most of the quantitative data collected in the study serves to assess the effects on student engagement, while some quantitative and qualitative student responses are used to assess the impact on student perceptions.
Literature Review

The Engagement Problem

Many studies have been conducted which indicate the various issues connected to student disengagement in high school. Students with low levels of engagement also usually exhibit academic struggles and lower course grades\(^2\). They often score lower on the high-stakes standardized assessments, though there may be no direct correlation between course grades and broader-scale assessments such as Virginia’s Standards of Learning tests\(^3\). Disengaged students also generally have less-positive relationships with their peers\(^4\) and higher rates of dropout.\(^5\)

Unfortunately, high-school student engagement wanes noticeably from the beginning of the school year toward the end\(^6\).

For all of these reasons, supported by my university coursework, experience, and educator training, I believe it is essential for students’ engagement to be bolstered as much as possible. While I cannot control their feelings or their parents, I can do my best to foster a classroom environment which promotes engagement. This leads to the next question: how can I increase the engagement?

Factors affecting engagement. One of the research teams seminal to the subject of engagement is the University of Rochester’s Ryan and Deci, with their Self-Determination

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According to the theory, the three psychological pillars of a person’s motivation and well-being in school and in other contexts are competence, relatedness, and autonomy (2000). When these psychological needs are met motivation, satisfaction, and health can improve. Hafen (2012) summed the theory well:

The need for competence is satisfied by the feeling that one can successfully produce desired effects and outcomes. The need for relatedness is derived from the experience of feeling close and connected to others one considers significant. The need for autonomy involves the perception that one’s activities and environment are matched and endorsed with the self. (246)

As one can see from these statements, it is the perceptions of the individual in question that truly matter in Self-Determination Theory. I did not examine effects of relatedness as part of this study, so I will focus on ways to improve perceptions of Competence and Autonomy.

**Competence.** For virtually any traditional classroom setting student competence reduces to an ability to understand, recall, and use the skills and information presented by the teacher. Ultimately, course grades should reflect competence with the material. *Feelings* of competence can be built using appropriate scaffolding for the students’ level of understanding. Particularly in science lessons there can be a huge and often overwhelming quantity of information which the students must process. Appropriate scaffolds help students focus on the most relevant

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Also important are students’ perceptions that their teacher holds mastery goals for them. Mastery goals emphasize a student’s personal growth and understanding, rather than comparing his or her performance against that of other students.

**Autonomy.** Autonomy represents an individual’s power to do what he or she wants at any given time. The psychological need for autonomy is filled by a person following his or her own desires in choosing activities. However, students are *required* to attend school (no choice). Some schools, such as Montessori schools, allow students work on any subject they like during open periods. By contrast, public school students are *required* to take a certain number and distribution courses. Traditional separate-subject high-school courses are largely confined to a specific set of competencies which students are expected to attain by course end. Virginia’s public schools are held to the official Standards of Learning or SOLs, and I am *required* to address the SOLs for my course. While genuine autonomy can be difficult to achieve in public high-school classrooms, giving the students at least some direction over the flow of class can be done. My goal is to let them help guide the instruction by diving deeper on the aspects they find interesting or confusing. If I can get them to *want* to learn, their autonomy will be better served.

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In the course of my research I came across an article suggesting a different look at competence and autonomy. Prawat\(^{13}\) recalls several bodies of research to make a case for what he calls *Idea-Based Social Constructivism*. He addresses thoroughly the cases made by teachers of subjects such as math and science for an emphasis on problem-solving techniques. I know that my own education has been focused on problem-solving, and I assumed this simply to be the way Physics is taught. Prawat instead suggests that teachers focus more on the big ideas of subject matter, since this gives priority to the transformative process of learning. Instead of presenting obstacles, he suggests that we mentor our students as apprentices, acting as a guide through a non-linear geography of the content. With a grounding in the key concepts, he argues, students are freed to go beyond them and approach new challenges with insight, rather than being confined to solving problems with which they are already familiar.

**Theory to Practice: Shared Formative Assessment**

My goal is to establish in my classroom a process of Shared Formative Assessment. Formative assessment is set in contrast to summative assessment. Summative assessment is done after instruction has taken place, to discern the sum of a student’s learning. Formative assessment, on the other hand, is the process of discerning what learning the student is achieving during instruction.\(^{14}\) Having students directly involved in their own formative assessments garners several benefits, and is called Shared assessment.\(^{15}\) Feedback is key to these shared formative assessments, since without the information the students cannot assist.\(^{16}\) However,


\(^{15}\) López-Pastor, Victor Formative and shared assessment in higher education. Lessons learned and challenges for the future.. *Assessment and evaluation in higher education*. (02/01/2017) , 42 (1), p. 77 - 97.

feedback alone does not necessarily improve student results, and must be precisely targeted to where they have fallen short and how they can improve. Additionally, it should be both specific to the task at hand and generalizable to wider applications.

Through Plickers I aim to have my students share in their own formative assessment, increase the dialogical nature of my instruction, and move away from simple information transmission. This should also increase student feelings of Autonomy by giving students more say in how the class goes and Competence by providing more targeted scaffolds for their understanding. These factors are also expected to increase classroom engagement.

In the modern context of high-stakes testing, it is attractive for me to assign problems to solve. However, it is really the deep thinking and overarching schema that I want the students to gain, and the number of students prevents me from directly mentoring each. With this in mind, Plickers should help make my class time more efficient and better serve the students’ autonomy by finding and addressing the questions they have rather than cover in detail all the questions that could possibly arise.

Students’ feelings of competence should be supported by giving them more information about their own understanding, and more immediately. This should also promote a sense of mastery focus, and allows scaffolding through careful sequencing of questions and by giving me the opportunity to adjust as I see issues arise. The process of batch-grading papers outside class time and assigning marks by relative performance (e.g. grading “on a curve”) undermines the idea that each student is responsible for personally tracking his or her own understanding, and making improvements where those understandings falter. The Plickers platform shows correct

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answers on a question-by-question basis such that students can perceive whether their understanding of each concept was diametrically correct or incorrect, instead of giving the imprecise sense such as “78% correct” that results from multiple-concept unit quizzes.

**Methods**

**School Context**

The research was conducted in my standard daily classroom with my Honors Physics students at a suburban public high school in Northern Virginia. As noted in the Introduction, the largely affluent, educated parents place high expectations on the students’ performance as pertains to college acceptance. These high pressures have led the much of the student body to commit themselves heavily to challenging coursework. For example, some students enroll in five or even six Advanced Placement courses in addition to one or two other “standard” courses in a single school year. Considering that AP courses are intended to be similar to college-level difficulty this often leads to low achievement in one or more courses, increasing stress and decreasing self-esteem in the students.

The way in which this affects my students in particular is two-fold. For most students Physics falls on their Junior year: a year of many AP course options and the added pressure of college visibility. Physics is therefore one of their “easier” classes. Indeed, in the culture of the school courses not labeled as Honors or better are considered by many to be sub-standard. However, Honors courses still receive a bonus 0.5 to their GPA calculation. I am told that the teacher whom I replaced was known to be an lenient grader and my suspicion is that the combination of these factors led many under-prepared students to sign up for Honors Physics.

**The Study**
The primary subjects of my research was my 5th-period section which occurs immediately following lunch, starting at 12:30 and ending at 2:00 pm. A few students in this section were truly unprepared for the course material, fell behind early in the year, and have disengaged due to discouragement and low self-efficacy. Others are generally engaged but have trouble maintaining focus during the entire class, due in part to post-lunch doldrums. Some classroom context was given in the Introduction, which is recapitulated here.

Lab activities can achieve high levels of engagement, but are time-consuming, ineffective instruction, and group work masks the misunderstandings of the weakest students. Student seating is in front-facing rows, which limits inter-student discussions. Direct lecture often leads to disengagement. Physics tests typically cannot be memorized for since a large emphasis is put on problem identification and solving, but formal problem solving is too time-consuming for me to grade on a daily basis. I have assigned readings for homework, but found that many students simply ignored the assignment, wasting valuable class time.

It is for these reasons that I began seeking a way to quickly get problem-solving feedback from all my students at once: 1) to avoid the confusion that comes with group assignments of which students did what work, and be able to identify individual understanding; 2) to have a sense of their understanding immediately, rather than being forced to grade after class, so that I could make formative assessments and adjust my lesson to better hit the weak spots; 3) I felt that many students fail to recognize when they have misunderstood, and an instant-feedback system would make that abundantly clear to them; and 4) to quickly confirm whether reading assignments had been done and encourage those who shirked to better meet expectations. I also expected 5) to get more of my students engaged for all of the reasons above.
Implementation of Plickers. I introduced the students to the Plickers total response platform, creating several brief quizzes. These quizzes were used to assess reading homework comprehension, to assess lecture comprehension, and to extend the presented content to new formats so that students would have exposure to such questions prior to taking the county’s common final exam. As the teacher I can immediately see how students are answering, as well as display for the class a breakdown of responses. I would then briefly elaborate on the results, varying my feedback based on the class-wide responses. Occasionally this would be done before revealing the correct answer, giving a bit more clarification and allowing students a chance to change their answers if they felt that had been in error. Other times I would open the class to brief discussion of the question so that students could hear the reasoning from their peers. Still other times I would take the chance to pull up an image or refer to a section of text for them to find what the correct answer should be. The platform allows for ad-hoc editions to be made to questions, which allowed me to admit errors on my part and clarify contexts on the fly. Once I even added an entire question while the students were contemplating another, in response to the shifting attitude of the class.

In summary, this tool did superficially meet my expectations for its power to improve my formative assessment practices and adjust my pedagogy accordingly. The actual effectiveness for student engagement and accountability was a bit harder to parse, as the data analysis will show.

Participants. The students involved in the study are those in my 5th period Honors Physics course (n=28). 57% are female (n=16) and 43% are male (n=12). 10 are Asian, 7 are American White, 2 American Black, 3 are Hispanic, 2 are of Indian descent, and 4 descend from various Arabic heritages. Though most of these students were born in the United States, many are mixed-race, bi-lingual, and have relatives abroad. Some data were additionally collected...
from all three sections of Honors Physics, a total of 87 students, including the 28 from 5th period. The other sections have similar demographic distributions.

**Data Collection.** Data collection took place from March 6th to April 6th, 2017. The 5th period section was filmed over several class sessions to accumulate baseline data and then to determine the impact of the introduction of Plickers. Prior to filming I checked with my administrator and with the county’s central office as to the ethical concerns of filming students. The parents of every student enrolled in this school system may opt-out their student from the standard photo/video release, but none in my class had done so. The film was reviewed by me and a volunteer student not from the section for Honor Society service hours. Students were identified as either Engaged or Disengaged using guidelines from the Behavioral Engagement Related to Instruction (BERI) tool (Lane, 2015)\(^{19}\). Engaged/Disengaged count was taken every five minutes of class starting five minutes after the opening bell of the 90-minute class period (17 points per period). First, five data points were rated as a group to establish reliability. Subsequently, each video was rated separately by myself and by the student, then data were compared between raters. Due to small differences in the time-stamps of data collection (30-60 sec), interesting differences in numerical results appeared. These disparate ratings were re-taken using a 30 second window rather than a snapshot and the comparisons fell more in line. Further discussion of the reasons for and implications of this method may be found following the Findings.

Students were also asked to respond by Google Forms to several questions on a daily basis in order for me to collect their gut-reactions to the class flow, before I had explicitly told

them that Plickers were the subject of my research. Due to being a new teacher I have tried several different instructional practices throughout the year so the students were not surprised to see me trying Plickers, and many did not make the connection until I told them. The questions used were adapted from a tool called the Classroom Engagement Inventory (Wang, 2014)\textsuperscript{20}. The tool includes items targeted to identify three major dimensions of classroom engagement: behavioral engagement such as careful listening; cognitive engagement such as use of metacognition; and affective engagement such as interacting with peers and feelings of agency. For my purposes I chose nine of the questions and adjusted the response structure to a 6-point Likert-like scale in order to exclude a neutral response. I also left a space open for students’ thoughts. These exit tickets were to be filled out at the end of class. Unfortunately, due to my forgetfulness and in part to the fact that it wasn’t graded, only about half of students filled out forms on any given day. In retrospect a physical ticket would likely have collected more reliable data, but for the purpose of consistency and with confidence that I could improve, I continued with the Google Form.

In addition to video recording and collecting daily exit tickets from 5\textsuperscript{th} period I made a broader survey of all my Honors students as to their general sense of the course at the beginning of the research project, then again more specifically targeted to their feelings on the Plickers platform at the end of my period of data collection. About 75\% of students responded to both surveys. The surveys were adapted from items on the “Attitude Toward Mathematics Survey”

WHAT THE PLICK WERE YOU THINKING

This survey targets several variables of student achievement: (a) goals for doing the academic work; (b) self-perceptions of ability for the class; (c) self-regulation and strategy use; and (d) persistence when faced with difficult problems. Also included were several items pertinent to this class compared to others and the effect of grading practices on student perceptions. The initial survey was taken on March 6, 2017 and included a total of 33 questions on a 6-point Likert-like scale and a free response section. The final survey was taken on April 6, 2017 and included 10 questions on a 4-point scale, assessing student response and affect toward the use of Plickers.

I also had several short conversations with various students after school to poll their impressions and hear their suggestions for my improvement. I made no recordings of these conversations and they were quite free-form, so I have no hard data from them. However, several of the open responses collected through the daily forms and final surveys echoed these conversations, so I will include my own impressions as part of my Concluding statements.

Results

Daily Engagement Self-Reports

Daily questionnaires were adapted from a tool called the Classroom Engagement Inventory (Wang, 2014). Each of the items from the Classroom Engagement Inventory were verified to load significantly with one of four factors affecting student engagement by Wang et al. These factors were Affective, Behavioral, Cognitive, and Disengagement. Out of a total nine items used in the present study, one assessed Affective engagement, four assessed Cognitive

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engagement, three assessed Behavioral engagement, and one assessed Disengagement. For each item on a given day there was a range of responses, with most items having some “6-total” responses and some “1-none” responses, though two of the items never experienced a “1.” The values of the responses for each item were averaged, then the averages were summed (with disengagement negative) in order to give an overall sense of the class’s engagement for the period. A score of 47 would represent perfect engagement for the class period. Of the five days collected, scores ranged from 27.7 to 31.75.

The highest score occurred on a day involving: a) a two-hour delay which shortened other periods, but not 5th; b) a Phet computer simulation lab; and c) an enrichment activity related to Nature of Science standards which was used to bring 5th period’s core instruction time down to more closely match the other periods. The second-highest score was 29.75 and occurred on a day including the Plickers activity. Questionnaires included a free-response section not included in the above scoring schema, which provide slightly more detailed insight into which parts of the lesson students responded to most. These results will be discussed following the Findings.

<table>
<thead>
<tr>
<th></th>
<th>March 8</th>
<th>March 10</th>
<th>March 16</th>
<th>March 20</th>
<th>March 29</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-Reports</td>
<td>27.76</td>
<td>28.56</td>
<td>31.75</td>
<td>27.70</td>
<td>29.75</td>
</tr>
<tr>
<td>Video (avg)</td>
<td>-no data-</td>
<td>63%</td>
<td>58%</td>
<td>55%</td>
<td>66%</td>
</tr>
</tbody>
</table>

**Video-Rated Observed Engagement**

Correlations between the average self-reported levels of engagement and the rated video averages (for an entire class period) were fairly good, with a difference of less than 10% total engagement. The video averages generally skewed lower. This is likely due to the inclusion of transition periods, during which rated engagement would drop down to 25% of the class or lower, a result enforced by the engagement measure and not unexpected. Classroom engagement
levels during non-transition periods typically hovered around 75%, though any one activity sees waning student engagement as time spent on it goes on.

Some activities naturally capture more student attention. Notably, a lab activity held outside the classroom (and thus outside the video) gathered the attention of all students during the approximate 15 minutes of its duration. I input these numbers from field notes, and this is typical of lab activities. Additionally, the enrichment activity mentioned above captured nearly all students for a significant amount of time. It did not convey much assessable course content, but it was certainly a pleasant change.

With this in mind I was interested to notice higher-than-expected levels of engagement for simple lecture with note-taking. Generally a lecture would earn about 75% down to 60% engagement. I assume this to be due in part to students’ familiarity with the practice and expectations of its importance. The computer-simulation lab from the University of Colorado’s Physics Educational Technology (Phet) website produced similar results, though it must be noted that the video camera could not see all the students’ computer screens. It is likely that some apparently-engaged students were in fact not on the assigned task. Field notes corroborate this assumption, but also indicate that a majority of students were at least exploring the correct simulation, if not following the provided procedure. Anyone not obviously off-task was deemed acceptably engaged for the purposes of the study.
Plickers activities fared better overall, starting near 80% and rarely falling below 65%. Though these raw numbers may not seem conclusive, Plickers activities generally held engagement at higher levels for longer periods of time. Also, the 5-minute intervals of the video-rating process mask momentary fluctuations in engagement, sometimes up to 100%, which are evident if one simply watches the recording. This was drawn to my attention immediately upon comparing ratings with my student assistant. Small differences in the exact time-stamp of rating (45 seconds, for example) would lead one of us to rate perhaps 95% or more, while the other rated 65%. This often occurred if one or more students hesitated in answering, or desired to change their responses; other students would become disengaged while waiting for class to move forward. We agreed as raters to take these disparate segments and re-rate them, including a slightly wider swath of time rather than a snap-shot in order to gain a more holistic picture of the activity’s effect. The reported numbers are the result. By contrast, inter-rater disagreement for other activities such as lecture were negligible, despite bearing the same time-stamp differences.

The best result for classroom instructional activities appears to be a combination of Whiteboarding (using small boards to enhance discussion and sketch thought processes) with the Plickers. In the past, a stroll around the room would indicate that many boards were being used
for doodling. However, with the inclusion of Plickers the time-pressure and requisite response helped to keep students on task while also taking advantage of the peer-interaction and low-risk ideation encouraged by the whiteboards. More data on this combination, in particular its effects over extended class time, would be required to draw a quantitatively supported conclusion.

**Survey-Indicated Effects of Plickers**

The final survey was administered on a four-point Likert-like scale to gauge student affect toward the Plickers platform and the instructional practices in which it was applied. The survey was verbally framed as comparative; whether the students feel each aspect of class is improved with Plickers. For example, “Do you learn more from your classmates when we’re using Plickers vs other times?”

<table>
<thead>
<tr>
<th></th>
<th>Attention</th>
<th>Involvement</th>
<th>Awareness of Confusion</th>
<th>Questions Addressed</th>
<th>Sustained Focus</th>
<th>Learning from Classmates</th>
<th>Learning Material</th>
<th>Prepare for Tests</th>
<th>Complete Reading</th>
<th>Arrive on Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nope.</td>
<td>0%</td>
<td>0%</td>
<td>3%</td>
<td>5%</td>
<td>9%</td>
<td>6%</td>
<td>11%</td>
<td>14%</td>
<td>10%</td>
<td>16%</td>
</tr>
<tr>
<td>A little.</td>
<td>17%</td>
<td>13%</td>
<td>23%</td>
<td>28%</td>
<td>26%</td>
<td>31%</td>
<td>8%</td>
<td>18%</td>
<td>10%</td>
<td>24%</td>
</tr>
<tr>
<td>Yeah, some.</td>
<td>38%</td>
<td>49%</td>
<td>35%</td>
<td>33%</td>
<td>30%</td>
<td>28%</td>
<td>45%</td>
<td>34%</td>
<td>17%</td>
<td>12%</td>
</tr>
<tr>
<td>Totally!</td>
<td>48%</td>
<td>38%</td>
<td>40%</td>
<td>35%</td>
<td>33%</td>
<td>37%</td>
<td>37%</td>
<td>34%</td>
<td>63%</td>
<td>47%</td>
</tr>
</tbody>
</table>

A few interesting trends appear. One is the very low rate of “nope” responses across all questions; students seem to like Plickers, and sentiments indicate that it generally does have a positive effect on aspects like focus and getting questions addressed. Despite this, the feeling Plickers would NOT help prepare for tests is comparatively quite strong. A gratifying point is the very high response rate that having a closed-notes Plickers Quiz would encourage completion of reading homework. One more is that the question with greatest combined “Yeah” and “Totally!” responses was “Do you feel you are more involved in the lesson when we’re using Plickers?”

**Findings**

Recall the stated research questions: *How can instant feedback affect student engagement in my classroom?* and *How can instant feedback affect individual student accountability in formative assessments?* My hypothesis was that introducing a total-participation, instant-
feedback platform to the class routine would increase the students’ awareness of and participation in their own formative assessments. Student engagement was also expected to increase as a by-product. Overall, I believe that my hypothesis was supported, though weakly, by the data produced in this study.

As to student accountability in shared formative assessment, the data do not reveal effects without some interpretation. The strongest indicators to me are the positive responses in the survey for Involvement, Awareness of Confusion and Completion of Reading. These three questions were targeted to find out how student actions might change due to inclusion of Plickers exercises. I was encouraged by these results, particularly since 68% of students indicated on the pre-study survey that they have trouble noticing whether or not they understand what’s being said. Additionally, since the Whiteboard exercises are a non-data-driven type of formative assessment, I was pleasantly surprised to see the positive interactions between that activity and the Plickers quizzes. Part of the reason for using Whiteboards is that the large print students use on them allows me to quickly see the direction of their thinking, in contrast to notes taken on college-ruled paper, for example.

Indications of bolstered engagement were weak, at best. As mentioned, these first forays of mine into use of Plickers met with only moderate results for total percentage engagement. However, I stand by my assertion that Plickers engender better sustained focus than lecture. Speaking from experience and field notes, I can say that the activity often helps to get the less-proactive students involved, and certainly encourages them to make more content-oriented conversation with their peers. It helps them sit back and look at the question, think about it, and discuss, rather than frantically taking down notes from presentation slides. Some students also
voluntarily copied down the Plickers questions and results into their notes, since they found value in revisiting the questions and informing their initial responses for later review.

**Discussion**

**Reflection**

The data from the study only weakly supported my hypothesis. I believe much more data would need to be collected to discern a significant shift in student engagement. Since so many factors affect the atmosphere of the daily classroom, such as field trips, quarter end, testing, other courses, and even the weather, that only a long period, perhaps an entire quarter, would be needed to separate the signal from the noise. Several limitations of this study are apparent: data collection was inconsistent, video captured students only from one angle, and most importantly the Plickers implementation was planned only minimally in advance and Plickers activities were new me as well as to the students. However, the findings are not without value. Critically, they show that the Plickers definitely have potential to become a powerful addition to my class routine. They also show that all those fancy words I learned during pursuit of my Masters of Education degree have some meaning for me personally. I began to look for more opportunities to advance my student’s autonomy and craft new questions following their lead, rather than sticking to my pre-packaged problem sets.

Furthermore, I am confident with a more planned and set routine for reading and answering, Plickers questions could significantly improve the observed engagement levels. As mentioned above, rapid fluctuations were evident in the video due to some students changing answers or lagging behind. With a more strictly-timed pattern for query, consideration, response, and reveal, the entire process could both retain engagement more consistently and also move faster. I was surprised during video review by the length of time spent on the Plickers activity in
some lessons. While I feel that the time was not wasted, I did think it could be made much quicker with better routine training.

**Implications**

I fully intend to continue using Plickers in my classes, and making much more regular use of them in the coming year. Their value for reading checks was made especially apparent to me, so I plan to have students pick up the cards upon entering the room and get started right at the bell. I hope this will also help get my students thinking about and engaged in Physics right away, and serve as the warm-up for my class. In fact, I have already used them a few times and noticed the students borrowing books to review the reading during our homeroom period, in preparation for the homework quiz. In the future I might take some more research specifically pertaining to the use of Plickers in conjunction with the Whiteboards, as this study had little actual data dedicated to that combination, but the jump was significant enough to pique my interest. I had not originally planned this combination, but the lesson at hand was conducive and it seems to have worked out well!

**Impact Presentation**

I have already shared my findings with other Physics teachers in the Collaborative Learning Team at my school. Another teacher has asked me to share the questions I have generated and offered to collaborate on making sets for next year. I’ll soon meet with my new teacher induction group and recommend the platform to them as well. I also have the opportunity to make a presentation at a professional development workshop in my school for teachers of many different courses.