The Walking Classroom | Oak Foundation

Classroom Testing Study | 2018

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THE walking classroom
walk. listen. learn.

OAK FOUNDATION

THE UNIVERSITY of NORTH CAROLINA at CHAPEL HILL

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Classroom Testing Study Overview

The purpose of the Classroom Testing Project was to:

- Test the impact of learning during physical activity on student short-term and long-term learning retention (Aim 1)
- Test post-activity classroom performance, attitudes toward learning, and mood in students who engage in a short bout of physical activity during a podcast and those who remain seated during a podcast (Aim 2), and
- Explore student perceptions about The Walking Classroom experience through short focus group discussions (Aim 3)

The impact of learning during physical activity on student short and long-term learning retention

Based upon analysis of performance on a 10 question quiz, students demonstrated significantly higher levels of learning while walking 6.23 (SD = 1.28) vs. learning while sitting both in the short-term 5.64 (SD = 2.06), and long-term.

The impact of physical activity on post-activity cognitive performance

Walking had a significant positive impact on cognitive test performance as measured through a timed 3-minute multiplication test (0-100) with the mean post-walking being 49.51 (SD = 20.28), while the mean post-sitting was 46.97 (SD = 21.86).

The impact of physical activity on mood

There were strong, significant effects of walking and sitting on student positive and negative affect. Most pronounced differences in positive affect were observed in mean difference drops from the baseline to after sitting measures of "alert", "enthusiastic", and "excited" moods toward learning. All measures of positive affect increased after walking, and all measures decreased after sitting. Similarly, negative affect markers all decreased after walking, demonstrating a strong positive influence of the Walk, Listen, and Learn program on student mood and attitudes toward learning.

Student perceptions of the Walking Classroom Experience

Students reported feeling happy, healthy, educated, smart, and excited while walking and learning. After walking and learning, students feel strong, relaxed, energized, happy, and alert. On days students are not able to do a walk, they reported feeling mad, bored, sad, sleepy, and tired. Students reported a desire to do a Walk, Listen, and Learn between 3-5 days per week, and if they were able to exercise during the school day every day, they would have more energy, be smarter, more athletic, more fun, and stronger. Students reported generally having PE one or two days a week for between 30-45 minutes.

II. PURPOSE & PROJECT DESCRIPTION

Previous program assessment conducted by The Walking Classroom has provided a clear picture of increases in student physical activity, feelings of teacher appreciation and efficacy as a teaching tool, and student self-report impacts the program has on the learning process, attitudes toward learning, mood, and concentration (Nationwide Teacher and Student Survey, 2017). Through the support of the Oak Foundation, we will build on this research and add additional methods of program evaluation that will demonstrate the student impact of

> *Through the support of the Oak Foundation, we will build on previous program evaluation and add additional methods that will demonstrate the student impact of integrating The Walking Classroom into 4th and 5th grade curricula.*

integrating The Walking Classroom into 4th and 5th grade curricula. This project was organized into five research Aims and three sub-projects as outlined below:

Classroom Testing Project

- **Aim 1** tests the impact of learning during physical activity on student short-term and long-term learning retention.
- **Aim 2** tests post-activity classroom performance, attitudes toward learning, and mood in students who engage in a short bout of physical activity during a podcast and those who remain seated during a podcast.
- **Aim 3** explores student perceptions about The Walking Classroom experience through short focus group discussions.

Year-End Survey Distribution & Analysis

- **Aim 4** adds validity to previous Walking Classroom research by distributing the year-end survey through an external party.

Health Literacy Data Analysis

- **Aim 5** analyzes pre and post Walking Classroom student health literacy data moderated by a variety of demographic variables.

This report focuses on the Classroom Testing Project.

Figure 1

Project Timeline

Phase One: Methodology, IRB, and Recruitment

- Finalize project methodology and complete the UNC institutional review board process for research with human subjects (Nov, 2017).
- Present any necessary modifications to the proposal based on the IRB review to TWC leaders (Dec, 2017)
- Utilize the mid-year survey to provide a brief description of the project to teachers and to provide an area for them to indicate interest in participating in the study. Most likely, we will utilize North Carolina schools to gather data, but the survey is a convenient first-touch for teachers to indicate interest or non-interest (Jan, 2018).
- First $25,000 payment to UNC transferred (January, 2018).

Phase Two: Data Collection

- Confirm interest and availability with teachers (Feb, 2018).
- Perform classroom visits, data collection (Mar/Apr, 2018).
- Teachers distribute post-tests and mail them to research team (Apr/May, 2018).
- Primary Investigator distributes end-of-year Walking Classroom Institute National Teacher Survey (May, 2018).

Phase Three: Data Analysis

- Analyze qualitative and quantitative data (June-Aug, 2018).

Phase Four: Distribution of Findings

- Present project findings to The Walking Classroom leaders (Oct, 2018)
- Submit Aim 1 & 2 manuscript* - top tier education journal (Nov, 2018).
- Submit Aim 3 & 5 manuscript* - Top tier healtheducation journal (Jan, 2019).
- Second $25,000 payment to UNC transferred (January, 2019).

*The Walking Classroom will be explained/promoted through the manuscripts and the Oak Foundation will be acknowledged for financial support.

III. METHODOLOGY

The purpose of the Classroom Testing Project was to:

- Test the impact of learning during physical activity on student short-term and long-term learning retention (Aim 1)
- Test post-activity classroom performance, attitudes toward learning, and mood in students who engage in a short bout of physical activity during a podcast and those who remain seated during a podcast (Aim 2), and
- Explore student perceptions about The Walking Classroom experience through short focus group discussions (Aim 3)

In order to achieve these aims, the study protocol was developed and Institutional Review Board acceptance was attained through The University of North Carolina at Chapel Hill. The target population was 4th and 5th grade students of veteran teacher-adopters of the Walking Classroom. This population was accessed through a single North Carolina county where most 4th and 5th grade teachers had access to The Walking Classroom material. Forty-one teachers from six schools were contacted, and nine teachers from four schools agreed to participate in the study facilitating access to $n = 327$ 4th and 5th grade children. After absences and missing data, the total sample was $n = 319$ children, with 55% ($n = 177$) boys, and 45% ($n = 142$) girls. Within this sample, the average percentage of students eligible for subsidized lunch was 81.25% with two of the schools at 99%. The percentage of students with North Carolina End of Grade-measured reading proficiency within the sample schools ranged from 28% to 52% with an average of 40.75%.

The sample was somewhat representative of the population of Walking Classroom users in that several lower-socioeconomic status school districts have been provided WalkKits through grant funding, however, there is a bimodal distribution of Walking Classroom users divided primarily by purchasers and grantees. This sample is representative of the grantee population as The Walking Classroom prioritizes schools that are high poverty and low-performing when it donates WalkKits.

Instruments & Data Collection

Walking Classroom content quizzes were utilized and corresponded to podcasts selected by the teachers. These quizzes were reviewed for content validity by an 8-person panel of teachers, researchers, and students. By utilizing the same tests for each of the four testing periods (baseline, post-walk, post-sit, and long-term memory), reliability was addressed.

Teachers selected two podcasts to be delivered to their students on two subsequent days. One week prior to students listening to the podcasts, a member of the research team administered pre-tests that corresponded to The Walking Classroom podcasts to be delivered while sitting and walking. Students who chose not to participate or did not have permission from their parents to participate were provided with an alternate journaling activity during the testing periods. One week following the delivery of the podcasts, a member of the research team collected post-tests to measure long-term learning retention.

Post-activity cognitive testing was measured utilizing a 3-minute timed 100-question multiplication test. Students were measured three times: baseline (one-week prior to podcasts), post-walking, and post-sitting. Due to a learning effect, the order of walking or sitting first was controlled for in analyses.

Student mood was also tested three times (baseline, after walking, and after sitting) utilizing the PANAS-10 which is an internationally validated measure of positive and negative affect. Finally, student perceptions of the walking classroom were gathered in short focus group discussions with the participants that occurred over lunch.

Data Analysis

To investigate the potential effects of physical activity on learning, long-term learning retention, and post-activity cognitive performance, a repeated measures multivariate analysis of covariance (MANCOVA) was utilized. This approach is recommended, as it better controls for potential Type I errors (false significant results) and allows for the insertion of covariates into the model. In each analysis, the participants' scores after both sitting and walking on the learning test, long-term memory, cognitive performance test, and mood tests were utilized as dependent variables in the model. In each model the participants' gender, grade, and whether the participant sat or walked first were inserted as covariates, to ensure each of these characteristics were controlled for in the analysis.

IV. TESTING RESULTS

Short and Long-term Learning while Walking vs. Learning while Sitting

In order to test the impact of learning during physical activity on student short-term and long-term learning retention, students took a pre-test for two different corresponding podcasts. These same students then took a post-test after doing a *Walk*, Listen, and Learn session listening to a podcast for one subject, and after a *sit*, listen, and learn session listening to a podcast for the other subject. Finally, these same quizzes were taken a third time by each student one week after the podcast to test long-term learning retention. Based upon this analysis of performance on a 10 question quiz, students demonstrated significantly higher levels of learning while walking 6.23 ($SD = 1.28$) vs. learning while sitting both in the short-term 5.64 ($SD = 2.06$), and long-term as demonstrated in Figure 2, $\Lambda = .991$, $F(2, 314) = 7.27$, $p = .007$.

Figure 2: Walk, listen & learn vs. sit, listen & learn mean quiz scores (1-10)
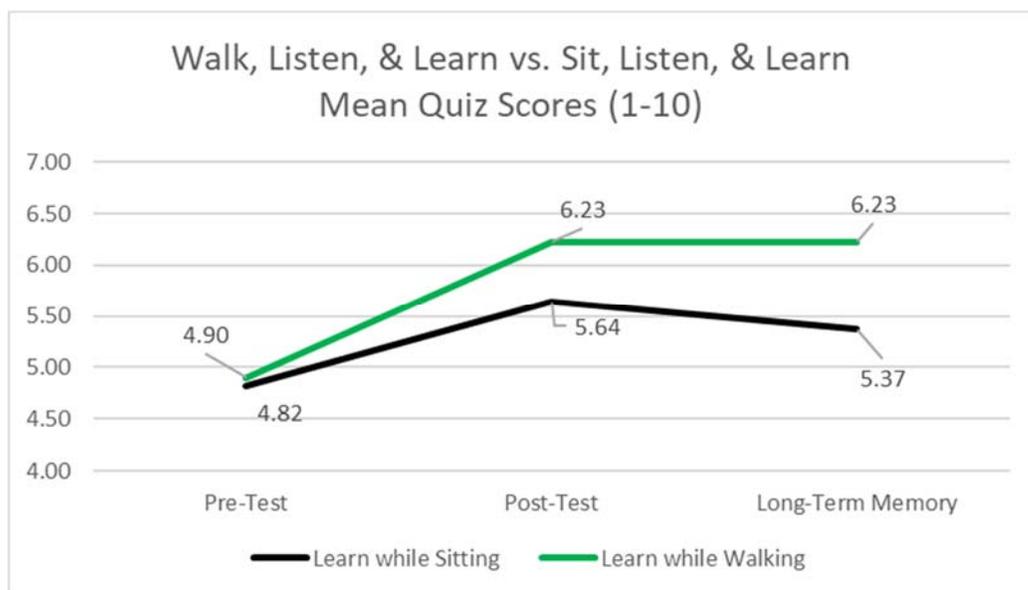
Post-Activity Cognitive Performance

Next, a repeated measures univariate analysis of covariance (ANCOVA) was utilized to investigate the potential impact of sitting vs. walking on a post-activity cognitive performance test. Scores on a 3-minute timed multiplication test were used as the dependent variable and sitting or walking just before taking the test was the independent variable. Grade and whether sitting or walking occurred first as covariates, as there was a learning effect observed with each of the three times the test was taken (as observed from the pre-test to the post-activity jump in scores). As indicated in Figures 3 and 4, walking had a significant positive impact on cognitive test performance with the mean post-walking being 49.51 (SD = 20.28), while the mean post-sitting was 46.97 (SD = 21.86), Λ = .989, $F(1, 315)$ = 6.938, p = .009.

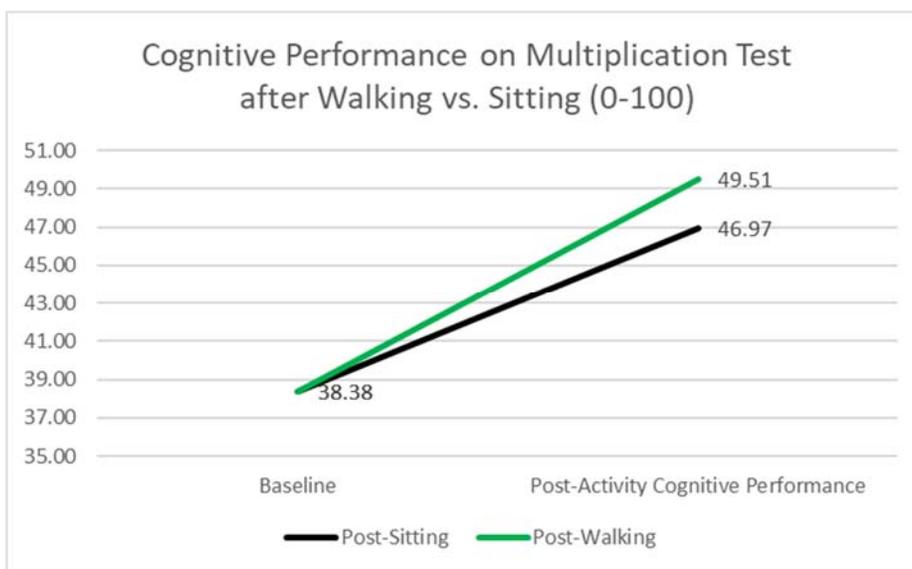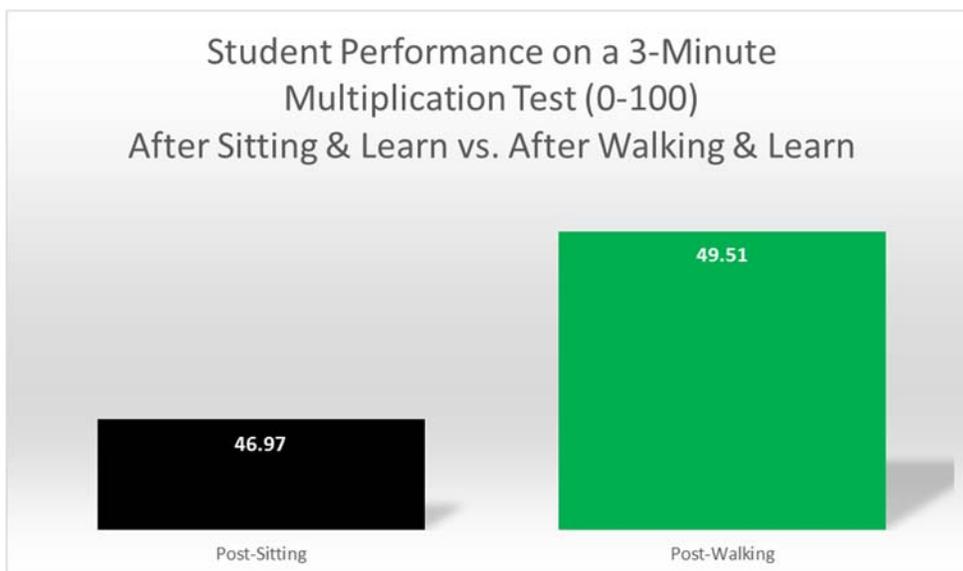Figure 3: Cognitive performance on multiplication test after walking vs. sitting (0-100)

Figure 4: Cognitive performance on multiplication test after walking vs. sitting (0-100)

Impact of Gender on Learning and Cognitive Performance

Overall, the analysis revealed that there was not a significant impact of the participant's gender on the effects of activity for learning or long-term learning retention. However, there was a significant impact of the participant's gender when it came to the results of a cognitive multiplication test post-activity. After walking, the scores on a cognitive test for girls increased significantly more than boys, $\Lambda = .977$, $F(1,315) = 7.401$, $p = .007$. Specifically, girls increased from an average of 40.80 ($SD = 20.26$) on the baseline test to an average of 53.57 ($SD = 22.04$) after walking, while boys increased from a 36.44($SD = 20.14$) on the baseline test to a 46.18 ($SD = 22.21$) post-activity. There was no significant difference across genders after sitting (See Figure 5).

Figure 5: Gender differences in cognitive performance on 3-minute timed multiplication test after a short bout of walking

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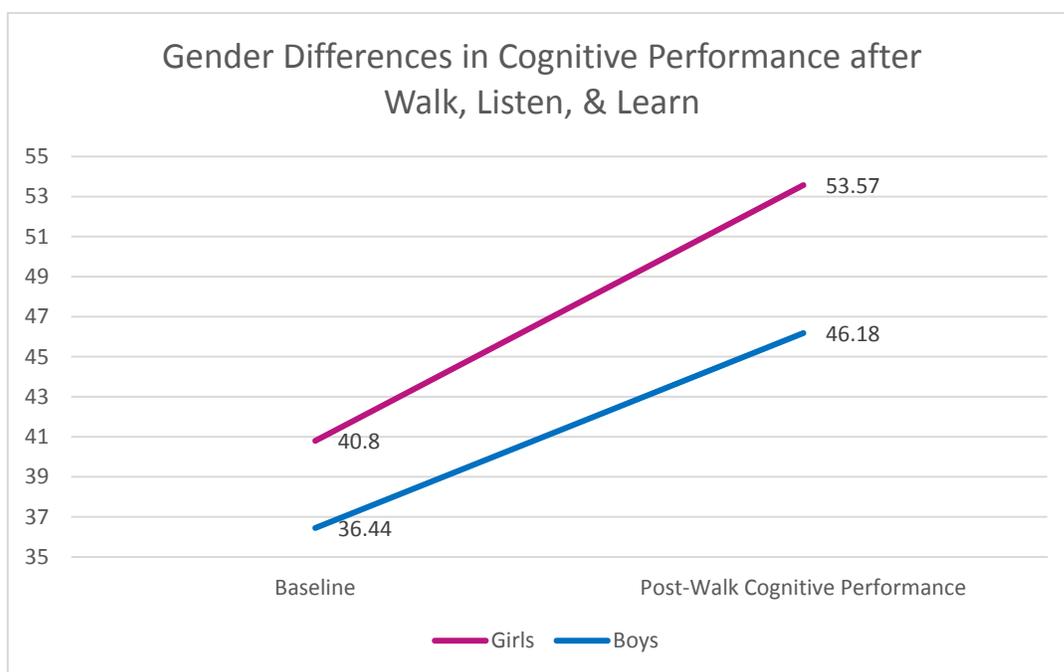
Post-Activity Mood Measures

Student mood was assessed through the PANAS-10 instrument, which consists of a number of words that describe different feelings and emotions. Students were instructed to indicate to what extent they felt the emotion at the moment of testing (during a normal classroom day, after walking, and after sitting). The ten items were paired with 5-point Likert scales ranging from (1) "not at all", (2) "a little", (3) "moderately", (4) "quite a bit", and (5) "extremely". Each of the words were defined for students while taking the test as there were questions in the first testing administration about the meanings of "enthusiastic" and "irritable", two of the 10 listed emotions.

There were strong, significant effects of walking and sitting on student positive and negative affect. Each of the means and standard deviations are listed in Table 1, and visual representations of positive and negative affect follow in Figures 6-9.

Table 1								
Student Positive and Negative Affect: Baseline, After Sitting, and After Walking								
	Baseline		After Sitting		After Walking		Within-Subjects Effect	
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*	*F*	*Sig*
Positive Affect	16.93	4.48	14.61	5.36	17.52	4.90	54.33	0.000
Strong*	3.67	1.28	3.35	1.45	3.74	1.34	12.26	0.000
Happy*	3.48	1.29	2.93	1.41	3.54	1.29	31.06	0.000
Alert*	3.41	1.43	2.97	1.56	3.76	1.40	33.67	0.000
Enthusiastic*	3.19	1.43	2.68	1.49	3.26	1.46	18.26	0.000
Excited*	3.17	1.43	2.69	1.53	3.22	1.41	17.01	0.000
Negative Affect	9.25	4.17	8.52	4.31	7.32	3.44	13.82	0.000
Irritable	2.24	1.40	1.99	1.33	1.74	1.23	4.31	0.038
Nervous	1.86	1.15	1.57	1.03	1.55	1.03	0.03	0.855
Upset*	1.84	1.25	1.74	1.23	1.38	0.87	12.35	0.000
Mad*	1.77	1.17	1.69	1.23	1.37	0.90	10.77	0.001
Sad*	1.54	0.98	1.53	1.12	1.29	0.78	8.63	0.003

Note: Individual scale items ranged feeling the emotion (1) not at all to (5) extremely at the time the test was administered. Composite PANAS scores range from (5-25).

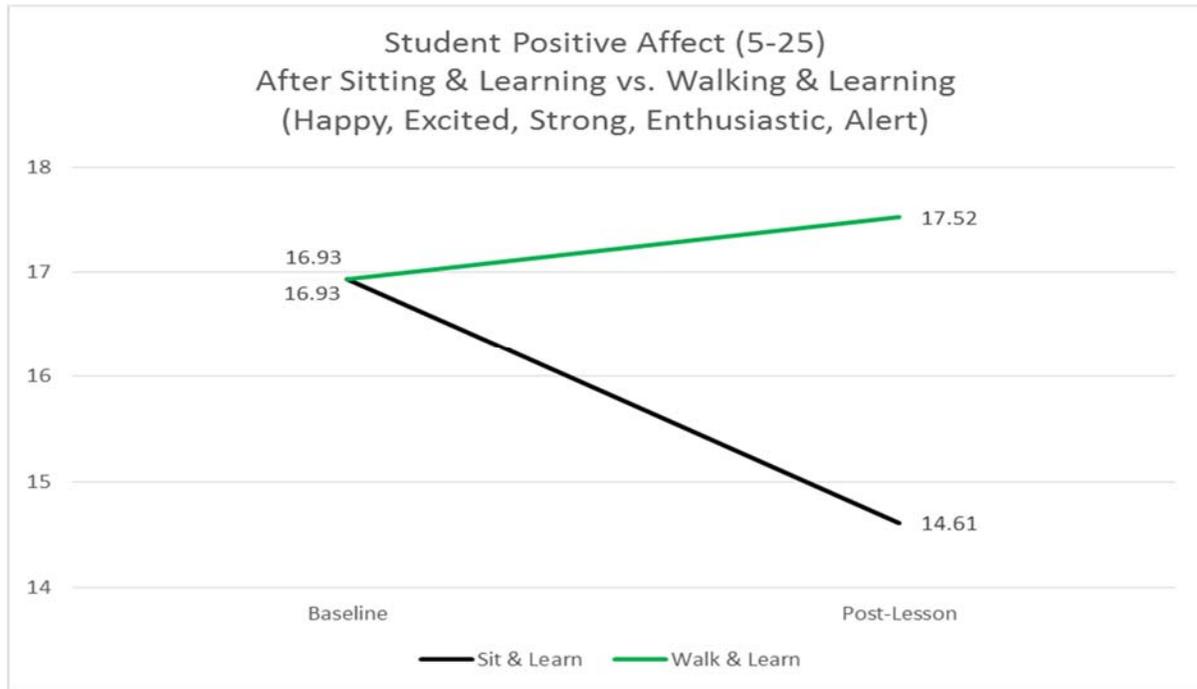Figure 6: Positive affect after sitting & learning vs. after walking & learning

Figure 7: Positive affect markers after sitting & learning vs. after walking & learning
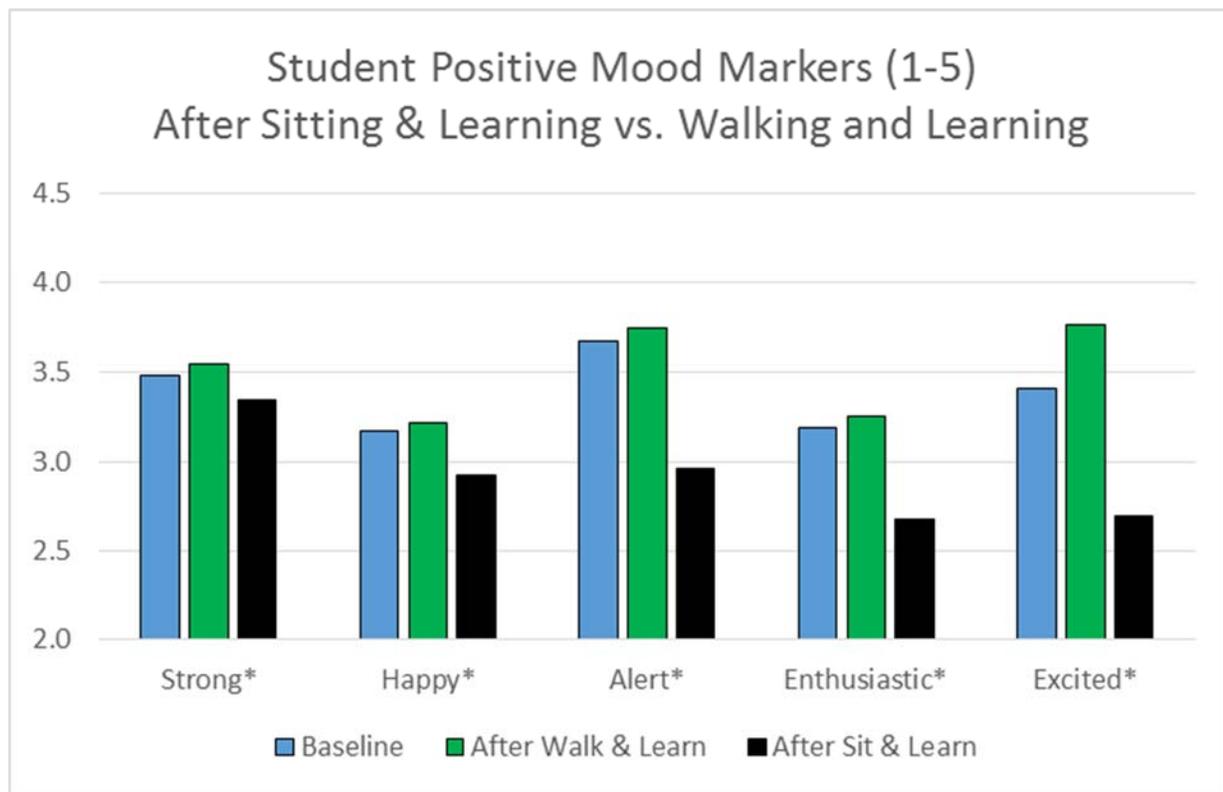
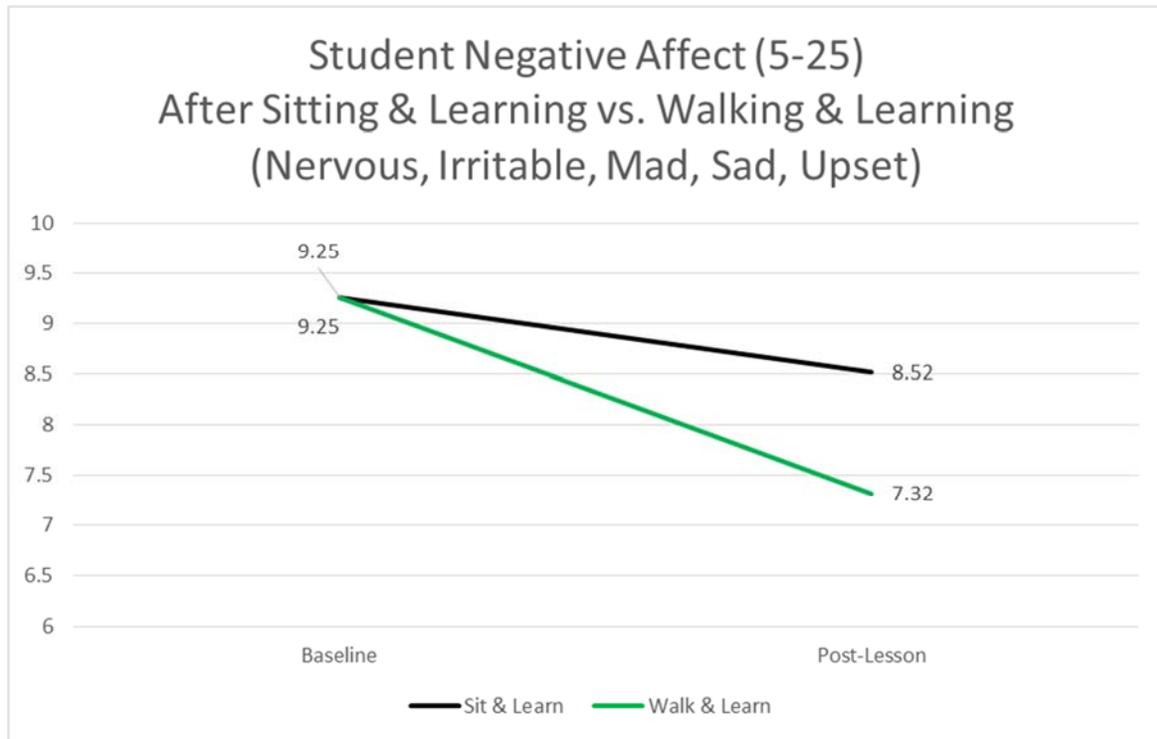Figure 8: Negative affect after sitting & learning vs. after walking & learning
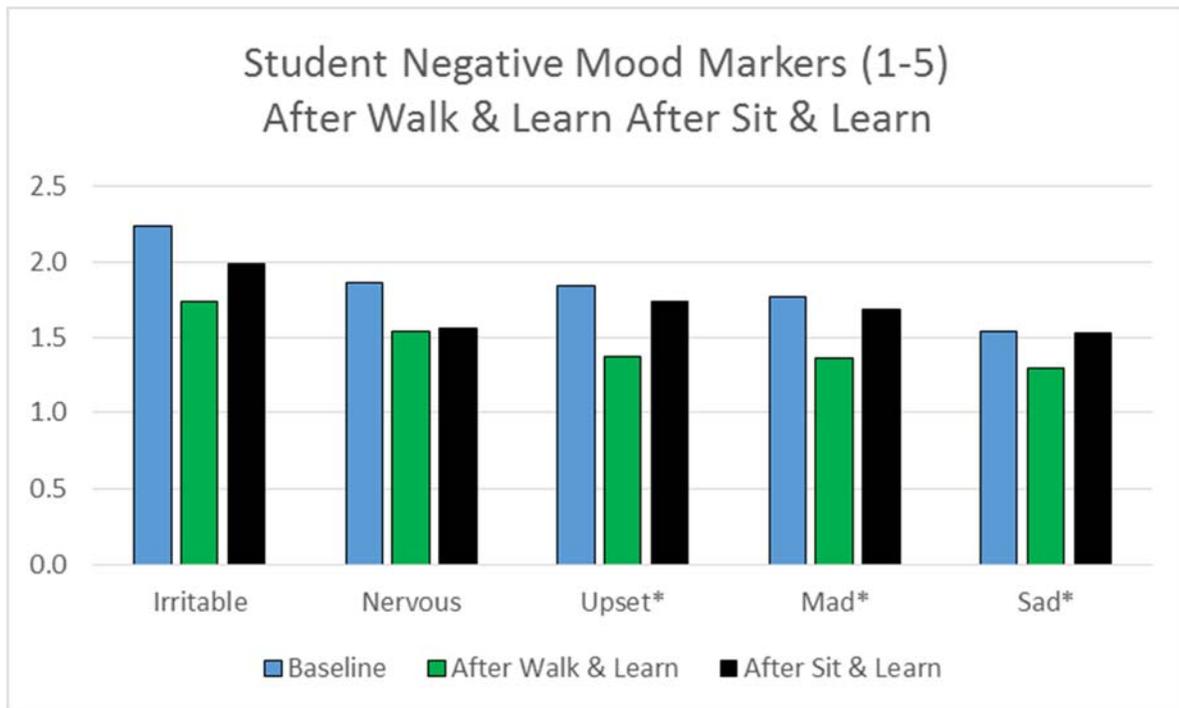

Figure 9: Negative affect markers after sitting & learning vs. after walking & learning

Student Perceptions about The Walking Classroom

Through a series of 10 lunchtime focus groups, students were asked a series of questions about their experiences with the walking classroom. Word clouds have been generated for the general themes expressed – larger words represent common themes within the discussion. Some of the longer phrases students mentioned are also included below.

How do you feel while you Walk, Listen, and Learn?

- *It is like educational music*
- *I feel educated*
- *I always imagine that I'm walking with a dreamy teacher*
- *I feel like one of the people I see going for a jog and listening to music*
- *I get a chance to exercise my legs because I'm sitting in a chair all day*
- *We learn history, poems, and other different cool things*
- *I love feeling the air on my face and breathing fresh air*

How do you feel after you Walk, Listen, and Learn?

- *My body feels happy that I went on a walk, but sad that we stopped.*

- *Mad and happy at the same time. Happy we did it, mad it's over.*

- *Excited that I'll get a 100% on the quiz because I listened to it.*

- *Feel like I lost a lot of pounds*

- *Great and exercised, like I just took a walk and found the sunset pond*

- *Happy because we don't have to do work and we just get to walk down the halls*

- *Like I can do anything*

- *I feel more educated, and strong at the same time*

- *I have energy all the time except when I'm in the classroom.*

- *I have more knowledge in my head*

- *I have released energy. I might be a little tired, but I can write down notes to study because I got to learn about things I couldn't have learned about in the classroom.*

- *Makes me want to learn more things – makes me feel a little bit happy*

- *Like I got some abs ☺*

- *Ready to take a test!*
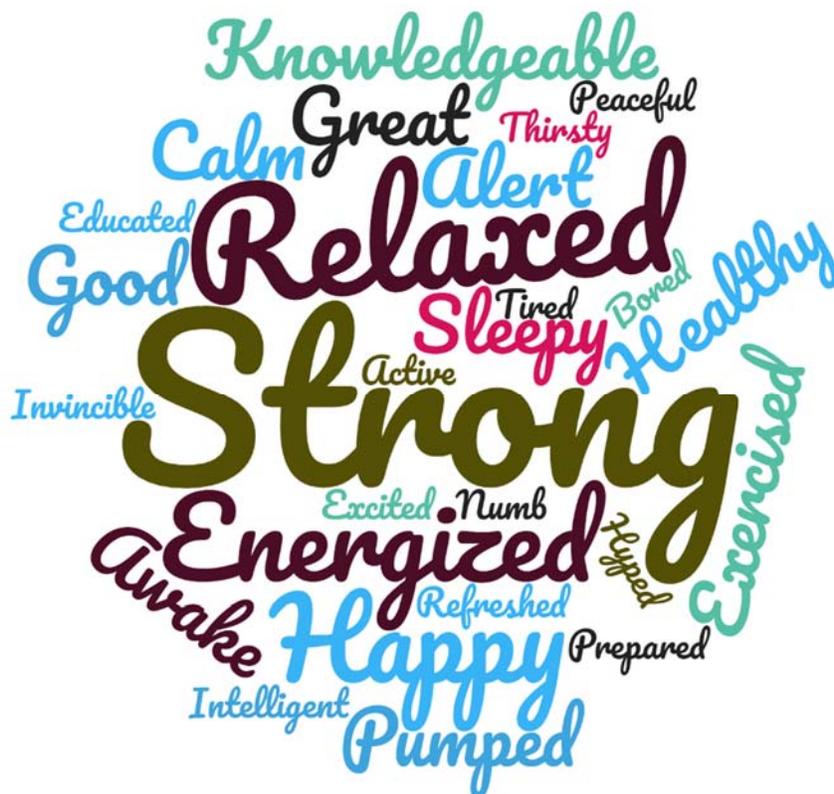
On days when you don't do a walk, how do you feel?

- *Feel like I'm stiff and my body can't move*
- *Like a couch potato*
- *Feel like my gut is growing because in school you barely move around. I want to move my legs!!*
- *I just want to cry.*
- *Like we didn't get to have any fun in school.*
- *I just want to get on my phone and do fun things.*
- *Like we're wasting time and losing knowledge*
- *Sad, because I don't get to exercise.*
- *Stressed – because I might have stuff built up in my body but I have to wait to do it.*
- *It is really hard to concentrate*
- *Not healthy*
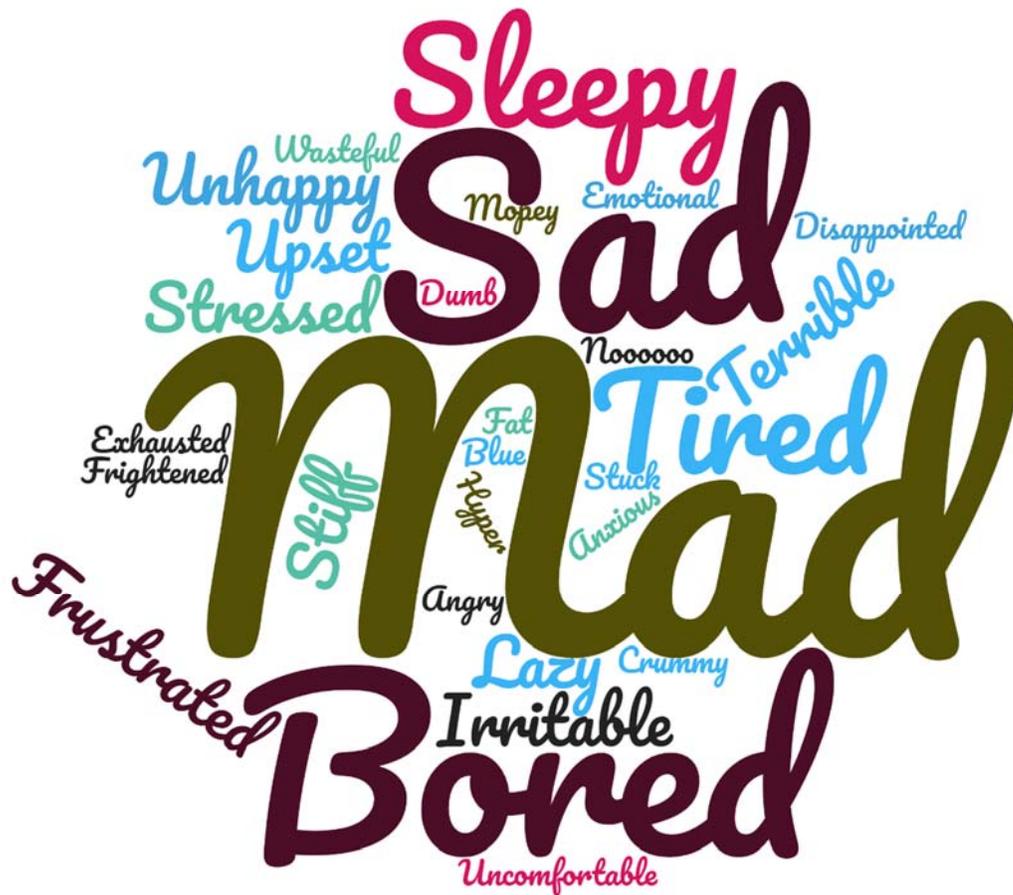
What are some things you like about Walking, Listening, and Learning with The Walking Classroom?

- *You can exercise and be active and learn at the same time!*
- *You don't just have to sit there and wait. You can learn while you move!*
- *I get to feel smart because we do a test afterward and it is always so neat to see how much we learned.*
- *Helps make my mind get better – helps me learn new stuff.*
- *I can talk to people about famous people that I learn about – and it's like I'm meeting famous people, like Maya Angelou.*
- *I've learned that I learn better through listening than through reading.*
- *I remember things better when I exercise while I learn rather than while I sit*
- *I feel like I have a new friend when someone is talking to me.*
- *It's exciting because you get to experience something new that you haven't done before. Usually people listen to music/rap instead of listening to learn something different.*
- *I've loved learning about people like George Washington Carver, Robert Frost, and Maya Angelou.*
- *My mom says I have ADHD because I can't sit down. I like to move around when I learn, so The Walking Classroom has been really good for me.*
- *We learn interesting facts about history and science.*
- *We get exercise while we walk. We learn and we lose weight!*
- *When I sit and learn, I fall asleep. I like walking SO much!*
- *When you're walking you feel some kind of difference*
- *It's like we're exploring with another class, which is really neat to feel like we're a part of something bigger.*

What are some things about your health that you have learned?

- *Eat vegetables! (Most common response)*
- *How to build cardiovascular endurance.*
- *Exercise helps our heart get stronger and our brain grow bigger.*
- *Exercise gets our heart pumping.*
- *It's more important to watch what kind of food you eat rather than how much you eat.*

- *Getting tired when you exercise is actually good for me.*
- *Stop eating fries and milkshakes.*
- *Have moderation on bad things.*
- *Most people don't take care of themselves.*
- *Eat healthy!*
- *You learn new big words about your health.*

What are some things you don't like about Walking, Listening, and Learning with The Walking Classroom?

- *Nothing!! (Most common response)*
- *When the ear-buds are dirty (2nd most common)*
- *When it turns on and off and it starts over.*
- *The band is itchy on my neck.*
- *When we learn about something we already knew*
- *When you walk too long or are breathing hard and you have another lap to go.*
- *When it's boring.*
- *When the podcast is too long*
- *There are no visuals*
- *It doesn't help me lose weight enough.*

How can we make The Walking Classroom better?

- *Add more topics (math, science, cells, ecosystems)*
- *Add videos and pictures.*
- *Get more people on the podcasts. Do math*
- *Have fun facts, vocabulary, or main idea general summary at the end*
- *Make it a game, phone, or video*
- *Make the Walk Kits more colorful*
- *Make the podcasts shorter/longer*

How often would you like to do a Walk, Listen, and Learn?

- *3 days per week (most common)*
- *5 days a week / every day*
- *2-3 times a week*
- *Every day and at home too!*
- *Every minute, every day, every second!*

How many days/week do you have physical education?

- *1 day per week (45 minutes)*
- *2 days per week (30 minutes)*
- *Boys go 2 days per week (50 minutes), girls go 1 day per week (50 minutes)*

How do you think it might affect you if you had PE or another type of exercise during the school day every day?

- *I would be more athletic / I'd build muscles / get so strong / could be a great gymnast*
- *I would get more exercise and be healthier*
- *I'd have more energy*
- *I'd lose weight (would make me happy because I'd get skinny)*
- *It would make me even smarter.*
- *If you walk when you're tired, you fall / I don't want to be a body builder / we'd get too skinny / our muscles might hurt / we need sleep.*
- *I'd have so much fun.*
- *We would have relaxed minds because we would be having fun, getting healthy, and learning.*

VI. LIMITATIONS AND FUTURE RESEARCH

Given the lower-income, lower-performing schools that were utilized as the sample for this study, it would be wise to replicate the testing with a sample of schools who have purchased the Walk Kits and are in higher-performing schools. Because reading was involved in testing elements of the study, reading limitations may have minimized the demonstration of actual learning and the effects of physical activity on learning may be even stronger.

Additional avenues of research could involve pairing the results of in-class testing with the Healthy Habits or Year-End surveys to find unique patterns in the data. As an example, it may be possible that students who report lower levels of daily screen time are more likely to enjoy the Walking Classroom content. Many additional fascinating cross-overs may be found between the different evaluation metrics the Institute is utilizing.