Using Online Techbooks in the Middle School Classroom- Pilot Study Analysis for 6th Grade World Civilizations and 8th grade Geography Classes

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Introduction

During the 2012-2013 spring semester Meridian Joint School District No. 2 (MJSD) piloted the use of the Discovery Education online techbook within several of its 6th (World History) and 8th (Geography) grade social studies classrooms. The techbook is an online textbook developed by Discovery Education and accessed through the Idaho Department of Education's Schoolnet web portal. This educational site offers an online textbook for students to access information, watch streaming videos related to course content, connect to primary sources of information, and provides teachers with assessments. The techbook provides teachers with coursework and lesson plans incorporating reading and activities based upon what they define as the "Five Es"- Engage, Explore, Explain, Elaborate, and Evaluate. For the purpose of the study MJSD analyzed three (3) models of techbook implementation for effectiveness. These in-class models were:

1) 1:1 implementation- every student has personal access to the techbook
2) 1:3 implementation- 1 "device" for approximately 3 students
3) Teacher only access with projector

Additionally, every student within the study had at-home access to the techbook and the materials within it. The study sought to determine if the use of techbook technology is a viable, economically prudent, and effective method of delivering course content to students within MJSD. Additionally the study sought to determine which implementation method would be best suited for students based on effectiveness, engagement, and overall use within the district's schools.

Issues addressed:

1) Impact of techbook use and models on student achievement.
2) Benefits and disadvantages of techbook use within classroom to both teacher and student.
3) Does techbook use increase student engagement in subject matter (technology)?
4) What are student perceptions of techbooks when compared to traditional textbooks?
5) Are techbooks an economically sensible alternative to traditional textbooks?

Literature Review

The use of computer-based textbooks has met mixed reviews by students, teachers, and administrators alike. Most of the research on this form of information technology stems however, from studies conducted within college and university-level courses. Much analysis is needed to determine the impact and effectiveness of this medium with younger students in the elementary and secondary grade levels. Since the inception of online information retrieved through websites in the 1980's, this form of technology has undergone major improvements—and continued improvements are sure to come based upon the needs of districts and schools and modifications based upon research of these tools (Vernon, 2006). The use of online textbooks (termed techbooks through the remainder of this paper) within both the elementary and secondary classroom provides numerous benefits ranging from concepts such as: the continual incorporation of the newest and most up-to-date information, providing access to current and therefore more relevant information, the use of "utilities" such as highlighting, note-taking, and speak-text within the techbook as a way for students to become more engaged in their reading, and simply having the ability to access many texts through one small device. Several studies, mainly at the university level, show that the implementation of electronic-text within classrooms provides results that lead educational leaders to question their effectiveness. The idea that paper text is "embedded" into our culture and preferred by most users must, however, be reconsidered and studied. This analysis must be in light of a generation of students at the elementary and secondary level who are increasingly comfortable with technology and its use to gather information.

Transforming the textbook. McFall (2005) speaks to the attempt of electronic techbook makers trying to replicate the experience of paper textbooks when, in fact, this form of media is becoming increasingly irrelevant. It is no wonder that this "new" technology has met with little measureable success in its present form. McFall implies that, if we wish to see enhanced student learning through the use of techbooks and other online learning tools, these programs will need to be designed with the goal of transforming the way students interact with the material and the "text". One way to increase student interaction with the text is to incorporate relevance of the material and "local" resources. With traditional

textbooks, this was very difficult to accomplish. Techbooks, however provide the ability to "hyperlink" information within the world-wide-web creating pathways for students to incorporate concepts encountered in their daily lives. This increase in local resources has been shown to add to a text's effectiveness (Shutes and Petersen, 1991).

The use of technology enables some utilities that are not possible with traditional textbooks. Some of the most familiar utilities that could increase student activity in reading are those that allow highlighting and note taking (which are stored within a student's particular techbook), speak-text (which reads the passage at a student's chosen "pace"), and embedded video related to content. These utilities may provide students with strategies that could increase active reading. Active reading enlists pieces of the current constructivist learning theory in that students will need to be active participants in their learning—rather than simply reading and trying to remember information. In this case they will be able to manipulate, work with, and assimilate new information as they proceed through the chapters and the course. One major finding in several of the studies is of the correlation between the ease of use and the organization of the information, with the perception of a techbook's effectiveness by students. This perception by students could directly impact a techbook's overall use and any outcomes that arise as a result (Mashaw, 2012; McFall, 2005; Vernon, 2008). Nonetheless, Vernon (2008) indicates that "paper pales in comparison when hyperlinks can lead the reader to extensive supplemental information, simulations, tutorials, glossaries, dictionaries, tests, and other resources in a few mouse clicks" (p. 417). McFall continues with an important point for most schools and districts that, if as these online books increase the benefits mentioned above, "it would [also] be ideal if they simultaneously reduced cost" (p. 74).

Difficulties with techbooks. Previous research on techbook use speaks to advantages as well as disadvantages. Some of the obvious disadvantages of techbooks are summarized by Brown (2012). He lists these as eyestrain, lack of availability (whether due to the lack of internet access or appropriate material) and inconsistent formats between various companies making the material. The later is doubly important since research has shown that the organization and ease of techbook use is highly correlated

with student perception of its effectiveness (Mashaw, 2012). Research cited by Woody, Daniel, and Baker (2010) shows that students do not read electronic text in the same way that they read a typical textbook. The readers from these studies indicated a higher degree of "skimming" computer-based information than they would with a paper-based text (Sheppard, Grace, and Koch, 2008). In fact, Nielson (2006) speaks to the "F"-pattern that many students use while searching for key terms in an online environment as an alternative to reading texts line-by-line. Sheppard et al. (2008) indicate that many students prefer printed versions if they plan to read the information in its entirety. Woody et al. (2010) also indicate that it is difficult to determine whether there is any variation in actual comprehension directly due to the use of online text- in other words they are uncertain if students learn more as a result of their use. They do, however, point out variables created by use of the technology that could lead to increases or decreases in student effort that would create differences dependent upon use. The de-motivating forces such as those mentioned above (eye strain from computer screens, lack of internet access, inconsistent formats, the tendency for students to "skim" material) could reduce the overall use and effectiveness of this medium within the classroom. A concern is raised from the standpoint of constructivist theory which entails that students need to actively manipulate and even create the material if they are to truly learn it. It is easy to see how the "cut and paste" features enacted through computer and techbook use could in fact decrease the active engagement with the material. Sheppard et al. (2008) highlights the fact that this could actually make plagiarism easier for students who simply cut, paste, and subsequently call material their own. A similar concern arises with the speak-text function which actually reads the passage aloud to the student- again decreasing active reading and participation. Sheppard et al. also bring up the alternative idea that this manipulation could, in fact, create more active reading and help for students having difficulties—thereby increasing comprehension of material and learning. Their study looked at college students taking an introductory psychology course and compared perceptions of techbook use as well as course grades between techbook users with those of physical textbook users. The results indeed showed some significant differences suggesting that students were much less likely to use a techbook in a class again after their initial experience with it and that they, on average, spent less time

reading (studying) the material. These groups did not differ significantly in the grades they earned for the course. This could indicate that the electronic text enabled them to learn the material at a faster and more efficient level (therefore they needed to study less) or, more likely, the students who chose to purchase the less expensive techbooks were those students who also tended to spend less time reading and studying. Obviously further research is necessary. Though there is much research indicating the preference of printed material over online information, much of the research poses the question: will today's more technology-influenced elementary and secondary students, those who are becoming ever increasingly familiar with online material, find more comfort in using this online format than previous students (Woody et al., 2010; Vernon, 2006)? If so, will this increased familiarity decrease the negative connotations of techbook use highlighted by current (mostly university level) students? Finally, what modifications can be made to the typical techbook which will increase student use and subsequent achievement?

Methodology

In order to assess the effectiveness of the techbooks within the participating classrooms analyses were set up to collect both quantitative and semi-qualitative survey data. A description of the collection methods and types of data are described below:

Quantitative analyses

Implementation method. In order to test the effectiveness of the techbooks as a tool for student learning, data were collected to compare student scores on End of Course (EOC) exams. Comparisons were made between the user groups (1:1, 1:3, teacher only, and control) to see if mean differences in exam scores exist as a direct result of different techbook use. This was done through both Analysis of Covariance (ANCOVA) and Multi-Level Modeling (MLM) analyses. In addition, data regarding use of the techbook was collected by the techbook web-publisher. This usage data involved the amount of "views" of particular features within the techbook such as passages read, videos watched, and times logged in to the program. This assessment of time spent using techbook was incorporated as an

additional covariate to both analyze, as well as remove the influence of the time students were on the techbook from the study of implementation models. Statistical analyses were performed and results recorded.

Preliminary Analysis of Student Outcomes on End of Course Exams. Student scores on end of course exams (EOCs) were compared as a method of assessing differences in learning and retention due the techbook and the different implementation models (1:1, 1:3, and supplemental). In order to assess these differences between groups two statistical analyses were performed. Across the groups mean scores were compared to a control group in both the fall and spring semesters of the 2012-2013 school year. First, effect sizes for each implementation model were compared to a control group. These values were subtracted from each other (spring from fall) in order to get a value (Δd) of the relative change between the models with respect to the control group. With this information an attempt was made to isolate changes directly due to the techbook and its implementation. Another statistical method, using an analysis of covariance (ANCOVA) model was used to find if preliminary group differences were due to socio-economic variance between schools. For this model the schools average EOC score was entered as a covariate. Results and adjusted means of this analysis can be seen in table 1 and indicate that preliminary differences could be removed by using the previous year's average school EOC as a covariate. Due to the quasi-experimental (non-randomly controlled) nature of the design (pre-chosen teachers and groups of students for particular models), the data analyses and comparisons between groups using the end-of-course exam was simply a method to verify or refute hypotheses gleaned from the student and teachers' survey data. Claims concerning the effectiveness and test-based outcomes of techbook use or implementation model based upon these test-based data should be made hesitantly as further study using a more valid experimental design would be necessary.

Table 1. *Preliminary ANCOVA Comparison of End of Course Exams between Techbook Groups*

World Civilizations (6th Grade)			
Techbook Usage Group	**Number of Students**	**Fall EOC Mean & Standard Deviation**	**Adjusted EOC Mean***
1:1 Model	106	.91(.08)	.84
1:3 Model	370	.85(.15)	.82
Supplemental Model (Teacher only)	1215	.83(.15)	.83
Control group (no techbook use)	1203	.83(.13)	.84

Geography (8th Grade)			
Techbook Usage Group	**Number of Students**	**Fall EOC Mean (SD)**	**Adjusted EOC Mean***
1:1 Model	181	.85(.16)	.79
1:3 Model	176	.77(.15)	.79
Supplemental Model (Teacher only)	163	.79(.20)	.78
Control group (no techbook use)	781	.79(.17)	.80

**Means adjusted using each school's average semester one EOC score as covariate.*

Perception and engagement analyses. Analyses comparing student and teacher perceptions of techbook use and effectiveness were performed via a pilot tested survey. The idea behind the collection of this data was to find and use the factors most highly correlated with successful technology implementation as a framework for techbook improvement. This framework would then serve as a way

to measure effectiveness as well as design and implement improvements. The framework that was developed is listed below:

a. Organization- ease of finding information, access to information.
b. Technology used- program, links, and variety of methods to engage students.
c. Utility- learning tools and features associated with techbook technology.
d. Content- relevance of material, appropriateness of level, how engaging to students, primary source material, Common Core State Standards.
e. Usage- student enjoyment, types of use, depth of knowledge through use.

Additionally, demographic questions were created to find possible patterns and differences among users which could help in improving the techbook and its implementation within certain populations within the district.

Survey pilot test. In order to assure the validity and the reliability of the survey (make sure it measured what we wanted it to) a pilot test of the survey was sent to an 8th grade Geography classroom within the district. Students took the survey and made recommendations based on areas such as confusion of question meaning, sentence structure, and spelling mistakes. This pilot was also used to perform a factor analysis to determine which questions were most reliable in measuring the individual constructs. This analysis was done through a Cronbach's Alpha test. Questions were removed to improve alpha values while subsequently maintaining a minimum of three questions within each category to ensure reliability. Cronbach's Alpha values over 0.70 indicate a high level of reliability (Garson, 2012). Values found from the pilot test of the survey are presented below:

Table 1. *Cronbach's Alpha Values for Survey Reliability*

Techbook Factor	# of Questions in Category	Alpha Value (α)
Organization	4	.858
Technology	4	.811
Utility	9	.781
Content	6	.845
Usage	7	.703
Total Survey (All Questions)	30	.926

Survey data collection and organization. The revised survey was entered into the K12 Insight internet-based survey program and sent to the various participating students throughout the district. The survey was opened and closed at the same time for all students to try to reduce variation in student perception and fatigue as a result of the end of the school year. A timeframe of two weeks was given and the survey was closed on the same day for all groups. Once the survey was "closed" the data was retrieved and organized for analysis within the SPSS statistical package for analysis.

Analysis of survey results. Descriptive statistics were first performed to gain a sense of the overall perceptions of the techbook as a whole and within each of the constructs of the usage framework described above. ANOVA analyses were performed to compare mean differences in perception between the different implementation groups. This information was used to gain an insight into the overall effectiveness of the techbook as a result of different usages and among different demographic groups. The idea was that by isolating subgroups that did better or worse than other groups, a target audience for best-practice implementation could be found. Also, groups that did significantly poorer could be studied for possible causes and successive improvement of the techbook or its implementation.

Correlations to techbook effectiveness. Pearson's correlation coefficients were found between each of the framework variables and students' overall perceptions of the techbook. This was performed

in order to determine relationships among the individual factors as well as to establish which of the factors most impacted the overall perception of the techbook. These factors were also analyzed for correlations among demographic variables and possibly most importantly, the learning outcome for the course- the final EOC score. Factors that are correlated most highly with overall techbook perception and/or EOC scores can therefore be used to determine the most effective characteristics of techbooks for future decisions at the school and district level.

Cost comparison

A comparison of costs between the online techbook and more "traditional" textbooks was performed to determine *cost effectiveness* of techbook implementation. The analysis was performed comparing total costs for implementation on a per student basis, across all pilot schools, and across the entire district's World History and Geography classrooms. In each of the scenarios the implementation model (1:1, 1:3, and teacher supplemental) was analyzed for expenditure. Furthermore, the cost of purchasing the technology to run the programs was included in the analysis—an Apple iPad Mini was used as the technology tool for this study.

Results

Survey results

Student and teacher survey results were collected and compiled from an online questionnaire that was distributed to participants through the K-12 Insight online survey program.

Student survey results. Classrooms that participated in the techbook study were surveyed (n=1470) and comparisons were made between groups (1:1 model, 1:3 model, and teacher supplemental). Additionally, *overall* values were found to give an indication of student perception of techbook across all grade levels and all schools. This was used in order to determine what students thought about each aspect of the techbook when either no difference between groups was found or group differences were not

relevant to the data. Table 2 below shows the values found for each category of the Technology Effectiveness Index as well as the values based upon the implementation model used.

Table 2. *Student Survey Data (rated on Likert Scale of 1-6, 3.5 is neutral)*

Effectiveness Index (EI) Framework Variable	***Overall n=1470***		***1:1 Model n=368***		***1:3 Model n=305***		***Teacher Supplemental n=773***	
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*
Overall Effectiveness Index Average (EI)	**3.84**	**0.86**	**3.78**	**0.82**	**3.84**	**0.80**	**3.88**	**0.90**
6th Grade EI Average	*3.88*	*0.88*	*3.76*	*0.90*	*4.05**	*0.72*	*3.88*	*0.90*
8th Grade EI Average	*3.69*	*0.76*	*3.80**	*0.70*	*3.55*	*0.82*	*n/a*	*n/a*
Organization of Techbook	**4.12**	**1.80**	**4.24**	**0.97**	**4.00**	**1.00**	**4.11**	**1.00**
Technology	**4.40**	**1.14**	**4.43**	**1.10**	**4.35**	**1.09**	**4.41**	**1.18**
Variety through Technology	*4.47*	*1.30*	*4.49*	*1.25*	*4.41*	*1.20*	*4.49*	*1.36*
Utilities through Technology	**3.56**	**1.14**	**3.30***	**1.16**	**3.81***	**1.01**	**3.62***	**1.14**
Utility Impact on Learning	*3.77*	*1.19*	*3.53*	*1.21*	*3.93*	*1.05*	*3.82*	*1.22*
Amount of Utility Use	*3.35*	*1.18*	*3.04**	*1.17*	*3.54*	*1.15*	*3.43*	*1.17*
Content	**3.99**	**1.06**	**3.94**	**1.03**	**4.02**	**1.00**	**4.00**	**1.10**
Engagement with Content	*4.14*	*1.37*	*4.00*	*1.34*	*4.20*	*1.33*	*4.18*	*1.40*
Relevance of Content	*3.46*	*1.10*	*3.43*	*1.10*	*3.49*	*0.98*	*3.47*	*1.14*
Appropriate Level of Content	*4.50*	*1.25*	*4.59*	*1.23*	*4.46*	*1.26*	*4.45*	*1.26*
Usage	**3.14**	**1.02**	**2.98***	**0.97**	**3.04**	**0.89**	**3.26**	**1.07**
Engagement and Enjoyment	*3.33*	*1.22*	*3.16*	*1.16*	*3.29*	*1.14*	*3.44**	*1.14*
Types of Use	*3.14*	*1.02*	*2.38**	*1.56*	*2.07*	*1.26**	*2.82**	*1.74*
Depth of Use	*3.56*	*1.20*	*3.44*	*1.30*	*3.76**	*1.17*	*3.49*	*1.14*
Overall Enjoyment of Techbook	**4.43**	**1.62**	**4.48**	**1.57**	**4.39**	**1.65**	**4.41**	**1.64**

* indicates statistical significance at the $p < .05$ level

Data from the student survey shows that the overall student opinion of the techbook (based upon the Effectiveness Index) is just slightly positive in nature (M=3.84, SD=.86). Based on the EI values there were some significant differences between groups when analyzed based upon grade level. In the 6th grade World Civilization class, the 1:3 model students reported a significantly higher EI values (M=4.05, SD=.72) when compared to the 1:1 model (M=3.76, SD=.90) and the teacher supplemental model (M=3.88, SD=.90); $F(2,1160)=5.38$, $p<.05$. This indicated a small effect size between the groups (d=.32).

Additionally, when analyzing the 8th grade Geography classroom students, significant differences in the EI values were found indicating that the 1:1 model (*M*=3.81, *SD*=.70) had significantly higher values when compared to the 1:3 model (*M*=3.55, *SD*=.82), F(1,284)=7.94, p<.05. Students within the 8th grade teacher supplemental model classrooms did not participate in the survey due to unknown reasons and therefore data for this group was not analyzed. The effect size between these groups was again "small" in nature (*d*=.30).

Results of individual aspects within the EI framework showed student perception within different facets of the techbook. The organization of the techbook was deemed by students to be positive in nature (*M*=4.12, *SD*=1.80) with no differences between groups. The Technology aspects and variety of learning enabled by the techbook was found to be positive by the students (*M*=4.40, *SD*=1.14) with no differences found between implementation models. Student perception of the *utilities* enable through the use of the techbook were average (*M*=3.56, *SD*=1.14) with the amount of use of the techbook enabled utilities being below average (*M*=3.35, *SD*=1.18). Significant differences were found between all implementation model groups with the 1:3 model indicating the highest amount of involvement with the utilities associated with the techbook (*M*=3.81, *SD*=1.01) and the 1:1 model indicating the least (*M*=3.30, *SD*=1.16); F(2,1443)=18.11, p<005. This indicates a small to medium difference between these groups (*d*=.44). The content of the techbook was rated positively by students (*M*=3.99, *SD*=1.06) with the students indicating engagement (*M*=4.14, *SD*=1.37) and an appropriate level of content (*M*=4.50, *SD*=1.25). The relevance of the content was rated below average by students (*M*=3.46, *SD*=1.10) and there was no differences found between implementation groups. The usage values found were rated below average (*M*=3.14, *SD*=1.02) and of particular interest is the result showing the *engagement and enjoyment* due to content value being below average as well (*M*=3.44, *SD*=1.26). Significant differences between groups were found with the teacher supplemental group having the highest mean (*M*=3.44, *SD*=1.26); F(2,1443)=6.98, p<.005. These differences however are all small in magnitude. Questions concerning the overall enjoyment of the "techbook experience" was rated positively (*M*=4.43, *SD*=1.62)

by students. There were no significant differences between the implementation models and student perception of enjoyment around the use of the techbook.

Teacher Survey Results. Teachers (*n*=24) were surveyed to gain knowledge of the techbooks match to curriculum, Common Core State Standards, as well as to gain further insight into student use. An overall teacher mean EI value was found to be just slightly above average (*M*=3.66, *SD*=.60). There were no significant differences found between the implementation-model groups with regard to teacher mean EI values (see table 3 below).

Table 3. *Teacher survey results (rated on Likert Scale of 1-6- 3.5 is neutral)*

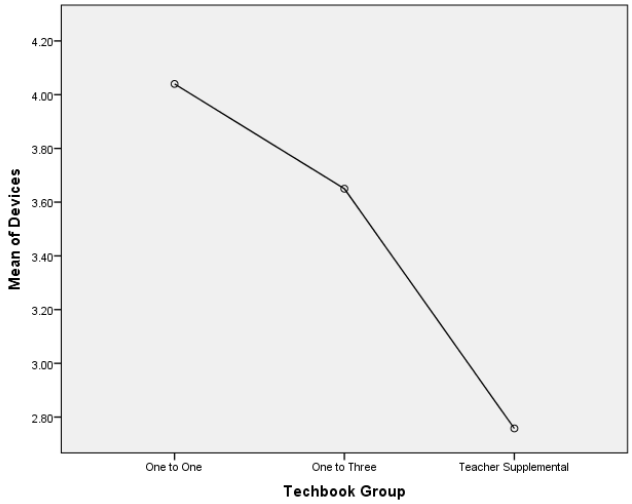
Framework Variable	***Overall n=24***		***1:1 Model n=5***		***1:3 Model n=4***		***Teacher Supplemental n=15***	
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*
Overall Effectiveness Index Average (EI)	**3.66**	**0.60**	**3.65**	**0.41**	**3.24**	**0.47**	**3.77**	**0.65**
6th Grade EI Average	*3.61*	*0.61*	*3.48*	*0.46*	*3.33*	*0.53*	*3.71*	*0.67*
8th Grade EI Average	*3.85*	*0.55*	*3.90*	*0.18*	*2.95*	*n/a*	*4.24*	*0.23*
Device Model (1:1, 1:3, Teacher Supplemental)	**3.21**	**1.09**	**4.04***	**0.46**	**3.65**	**0.30**	**2.76**	**1.17**
Organization of Techbook	**4.03**	**0.96**	**3.89**	**0.92**	**2.82***	**1.13**	**4.40**	**0.66**
Technology	**4.16**	**0.88**	**4.24**	**1.21**	**3.15***	**0.66**	**4.40**	**0.64**
Utilities through Technology	**2.79**	**1.03**	**2.32**	**0.86**	**3.15**	**0.53**	**2.85**	**1.16**
Content	**4.12**	**0.86**	**3.90**	**0.67**	**3.25**	**0.75**	**4.42**	**0.79**
Teacher Resources	*3.65*	*1.00*	*3.16*	*0.55*	*2.85*	*0.57*	*4.02*	*1.02*
Match to Curriculum and Common Core	*4.41*	*1.07*	*4.55*	*1.32*	*3.31*	*1.18*	*4.65*	*0.82*
Depth of Learning through Content	*4.29*	0.94	4.20	0.45	3.38	0.85	4.57	0.96
Relevance of Content	*4.40*	*0.80*	*4.07*	*0.72*	*3.75*	*0.92*	*4.69*	*0.70*
Expected Improvement through Techbook Use	**2.88**	**1.25**	**2.69**	**0.55**	**1.25**	**0.50**	**3.40**	**1.17**

* indicates statistical significance at the p< .05 level

Analysis of teacher survey data indicated no different values when looked at across grade level or course. The appropriateness of the model was found to be significant based upon teacher opinion. The

highest value of model appropriateness was found for the 1:1 model (*M*=4.04, *SD*=.46), next the 1:3 model (*M*=3.65, *SD*=.30), and last the teacher supplemental model (*M*=2.76, *SD*=1.17). The non significant difference between the 1:3 model and the teacher supplemental model in most likely in part to the large standard deviation of the later group-- but the general trend is obvious that teachers feel that more access to technology will allow appropriate use of the resource (see figure 1 below).

Figure 1. *Techbook implementation model vs. Teacher Perception of Model's Appropriateness*



When asked the question of whether the teacher would choose the *techbook* over the traditional textbook based upon the current model of implementation, there was roughly an even division among those who *would* choose the techbook (44%) and those who would not (56%). When asked, however if the teachers would use the techbook as in integral part of their lessons if they only had teacher access to technology (teacher supplemental group), 92% of the respondents said that it would *not* be used within their classroom. The 8% (2 individuals) that said they indeed would frequently use it in a teacher supplemental model were all from the "teacher supplemental" group within the study.

The organization of the techbook was found by teachers to be positive (*M*=4.03, *SD*=.96) and the design and variety offered to student through the technology was positive as well (*M*=4.16, *SD*=.88). Again, the utilities offered by the techbook were not deemed to be very useful or used by teachers taking the survey (M=2.79, *SD*=1.03). There were no differences between groups regarding the use of the utilities. The content was rated high by all teachers (*M*=4.12, *SD*=.86) and they indicated that the content

was aligned to Common Core State Standards (*M*=4.41, *SD*=1.07) and relevant to the real world (*M*=4.40, *SD*=.80). The resources offered to teachers were rated just slightly above average (*M*=3.65, *SD*=1.00). Teachers did indicated that expected student outcomes (tests or class grades) would not improve as a result of their use of the techbook--as indicated by the low mean scores on this question set (*M*=2.88, *SD*=1.25). No statistical differences were found between groups on this question.

Correlations. Pearson correlation coefficients were found in an attempt to isolate the EI factors that most closely were associated with increase EI values. These values can be seen in table 4 below.

Table 4. *Correlation Coefficients for Student Usage and EI Framework*

	Technology	***Content***	***Average EI Index***
Student			
Engagement and Enjoyment of Techbook	*0.67**	*0.69**	*.79***
Student Logins	*-0.20***	*-.23***	*-0.21***
Passages Read	*-.20***	*-.20***	*-.21***
Total Accessed Techbook Features	*-0.20***	*-.20***	*-0.19***
Teacher			
Choice of Techbook (1) over Textbook (2)	*0.50**	*0.42**	*-.48**
Expected Outcome Increase from Techbook use	*0.41**	*0.73**	*.51**

** indicates significant correlation at the p<.05 level
** indicates significant correlation at the p<.01 level

Correlation results indicate that the most significant factors associated with student engagement and enjoyment of the techbook were based upon the technology used (*r*= .67) and the content of the techbook (*r*= .69). The overall EI value was highly correlated with engagement and enjoyment of the techbook as well (r= .79). Usage data gave an indication of how often students logged in to the techbook as well as how much students used its particular features. These data showed that there were small, but highly significant negative correlations between both the amount of student logins *and* total techbook features accessed when paired against the average EI index (*r*= -.21 and *r*= -.19 respectively). Additionally, student reading amounts within the techbook showed small but highly significant *negative* correlations with the average EI score (*r*= -.21). The only positive correlations found involving amounts of usage within techbook arose along with the amount of videos watched when paired with the overall EI value, though this correlation was non-significant.

Correlations with teacher data were performed to find factors associated with the teachers' choice of the techbook as their sole resource in the future and whether they thought the techbook would positively impact student grades within their classroom and on end of course tests. Strong and significant for technology and content in their decision to choose the techbook over a traditional text book (r= .50 and r= .42 respectively). Strong and significant correlations were found between both the technology and content of the techbook with regard to whether teachers thought the techbook would improve student outcomes (r=.41 and r= .73 respectively). A significant correlation of r= .51 was found between the EI score and whether teachers felt improvement in student outcomes would occur within their class indicating a connection between the overall EI value and teacher perception of effectiveness of the program.

End of Course Outcome Data Comparison. Table 5 below shows the results of the end of course grade comparison between the three techbook implementation models by course. Positive effect size changes are seen for the 6th grade-World civilization classes and negative effects sizes are seen for the 8th grade-Geography class. Within the 6th grade classes, the largest gains (when compared to the control group) were made by the teacher supplemental group. The low student average usage value and lack of teacher usage data makes it difficult to determine if these increases are the result of teachers' use of the techbook, or due to individual teacher variance. What does stand out is the positive values for 6th grade classes and the negative values for the 8th grade classes.

Table 5. *End of course grade data comparison by course and implementation model*

6th Grade- World Civilizations	*n*	*Fall Mean Score and Standard Deviation*	*Fall Effect Size (d) from Control*	*Spring Mean Score and Standard Deviation*	*Effect Size from Control*	*Change in Effect Size from Fall to Spring (Δd)*	*Average Logins number of student techbook Logins*
1:1 Model	178	.88(.09)*	0.29	.84(.10)*	0.42	**+.13**	**17.8(3.72)**
1:3 Model	329	.86(.10)*	0.1	.82(.12)*	0.25	**+.15**	**2.70(1.90)**
Teacher Supplemental	869	.85(.10)	0	.82(.12)*	0.25	**+.25**	**1.70(1.70)**
Control group	1054	.85(.10)	n/a	.79(.12)	n/a	**n/a**	**0**
8th Grade- Geography							
1:1 Model	175	.87(.11)*	0.42	.86(.10)	0	**-0.42**	**7.20(.56)**
1:3 Model	169	.79(.11)*	-0.25	.83(.11)*	-0.27	**-0.02**	**1**
Teacher Supplemental	301	.84(.12)	0.17	.84(.11)	-0.18	**-0.35**	**0**
Control Group	557	.82(.12)	n/a	.86(.11)	n/a	**n/a**	**0**

* indicates significantly different mean from control group

Cost analysis and implementation model comparison. Cost comparisons were completed to look at the feasibility of the various models of techbook implementation. These findings are presented below.

Table 5. *District-wide techbook implementation cost comparison*

	Techbook Costs			**Technology Costs**			
	Total Students throughout District	***Cost Per Student***	***Techbook Lincensing Cost***		***1: 1 Model***	***1:3 Model***	***Teacher Supplemental***
1 Year Techbook Cost				6th Grade Devices	1015	348	0
6th Grade World History	2805	$17.00	$47,685.00	8th Grade Devices	420	144	0
*8th Grade Geography	2848	$8.50	$24,208.00	*Total Devices*	*1435*	*492*	0
Total	5653		**$71,893.00**	Cost	**$443,415.00**	**$152,028.00**	**$0.00**
				Costs based on purchase of iPad mini device. Current cost is $309.00 each.			
3 Year Techbook Cost				6th Grade Devices	1015	348	0
6th Grade World History	2805	$29.40	$82,467.00	8th Grade Devices	420	144	0
*8th Grade Geography	2848	$14.70	$41,865.60	*Total Devices*	*1435*	*492*	0
Total	5653		**$124,332.60**	Cost (last year of 3 year lifespan)	**$443,415.00**	**$152,028.00**	**$0.00**
				Costs based on purchase of iPad mini device. Current cost is $309.00 each.			
6 Year Techbook Cost				6th Grade Devices	1015	348	0
6th Grade World History	2805	$48.00	$134,640.00	8th Grade Devices	420	144	0
*8th Grade Geography	2848	$24.00	$68,352.00	*Total Devices*	*1435*	*492*	0
Total	5653		**$202,992.00**	Cost X 2 (3 year lifespan)	**$886,830.00**	**$304,056.00**	**$0.00**
				Costs based on purchase of iPad mini device. Current cost is $309.00 each.			

* 8th grade course is a semester course. Student costs are therefore divided in half to represent 1/2 year.

Table 6. *Total techbook costs by implementation model**

	Techbook Models		
Years of implementation	***1:1 Model***	***1:3 Model***	***Supplemental***
1 Year License	$515,308.00	$223,921.00	$71,893.00
3 Year License	$567,747.60	$276,360.60	$124,332.60
6 Year License	$1,089,822.00	$507,048.00	$202,992.00
12 Year License	$2,179,644.00	$1,014,096.00	$405,984.00

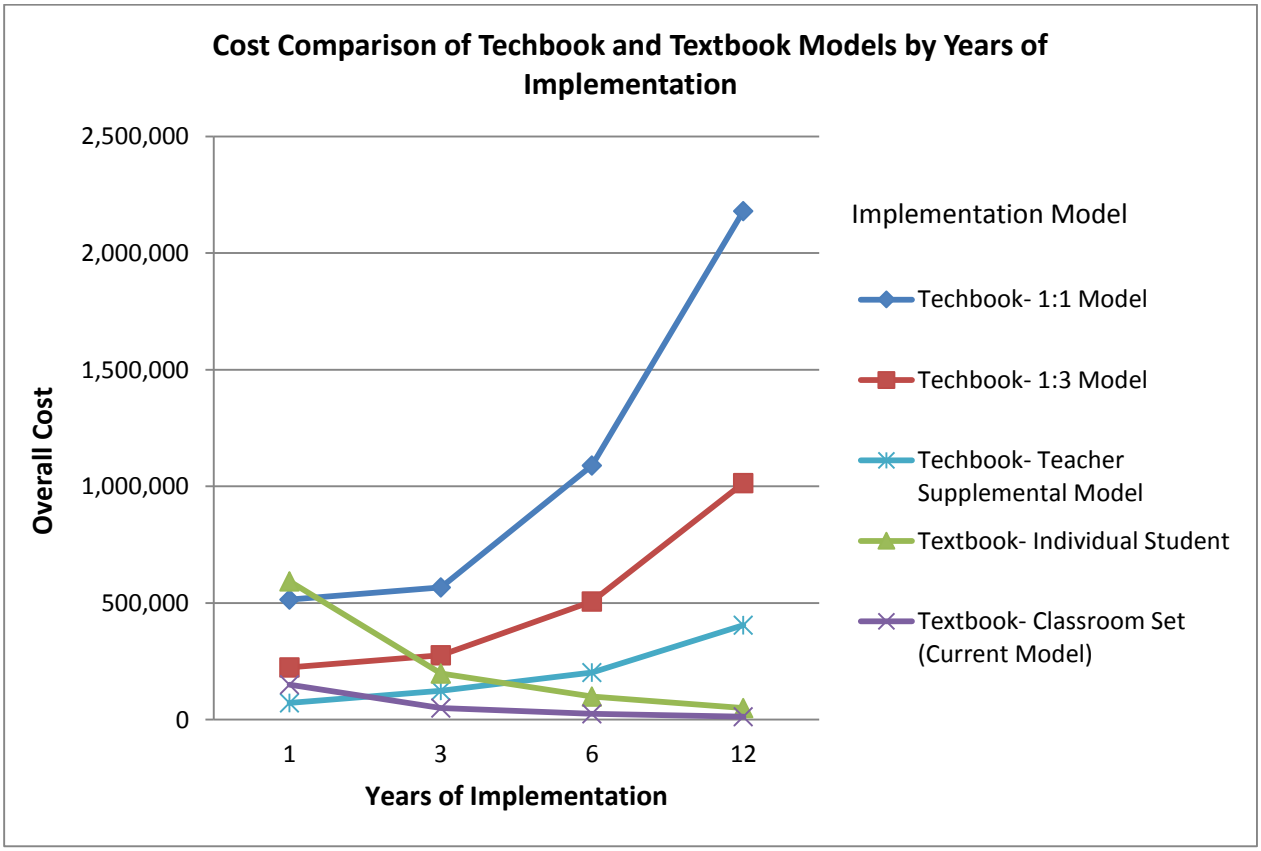
*Total costs DO NOT include $35,000 for substitute teachers during first year's 10 days of PD training. This training is offered through contract and licensing fee by Discovery Education. Additional professional development will also be needed for new teachers in subsequent years.

Table 7. *Traditional textbook costs by year*

1 Year (original purchase price)		**3 Year Renewal**		**6 Year Renewal**		**12 Year Renewal**	
Classroom Set (41 Teachers)	*Individual Student*	*Classroom Set (41 Teachers)*	*Individual Student*	*Classroom Set (41 Teachers)*	*Individual Student*	*Classroom Set (41 Teachers)*	*Individual Student*
$150,675.00	**$593,565.00**	**$50,225.00**	**$197,855.00**	**$25,112.50**	**$98,927.50**	**$12,556.25**	**$49,463.75**

* Based on estimated textbook cost of $105 including shipping and 35 students per class and 2012/2013 district enrollment.

Figure 2. *Cost comparison between implementation models by year of use*



The table above shows relative cost comparisons between various implementation modes. Where the model lines intersect gives an indication of the number of years of implementation where costs become equal between the models.

Discussion

Conclusions concerning the implementation of the Discovery Education techbook within Meridian Joint District No. 2's classrooms are based upon data that has been triangulated from a combination of student survey data, teacher survey data, and grade score data (based on end of course examinations), usage data, and cost analysis. Though the design of the experiment was quasi-experimental in nature with predetermined classes chosen for particular use of the techbook, there was sufficient data to make some generalizations about this techbook in particular and possibly online textbooks as a whole in general across the district. The large number of students that participated in the study (n=1470) gives an indication of how students in similar grades and situations within Joint District No. 2 would encounter the current technology surrounding online techbooks. These conclusions are drawn based upon the notion that many of the techbook's *physical* and *structural* features were rated highly by the students. This leads us to believe that implementation and use are the main variables in the study. Conclusions drawn are based upon current amounts of teacher training, current amounts of variability of teacher educational technology implementation, and current amounts of constructivist teaching methodology being employed within our schools.

Student and teacher interaction with the techbook. Students used the techbook in three different models of classroom implementation (1:1, 1:3, and teacher supplemental). There was little difference between groups with regard to most aspects of the techbook and perceptions of its effectiveness across the various models. This was measured using a research-based method of assessing online and computer-based learning called the Effectiveness Index (EI) developed by Mashaw (2012). Differences were seen, though small in effect size, indicating that possibly the 1:3 model was deemed slightly more effective within the younger group of students (6^{th} grade World Civilizations). This conclusion is based upon the statistically higher value for overall EI mean for this subgroup which

correlates highly with overall enjoyment and engagement within the techbook (r=.79). It is also seen that the 1:3 model encouraged students to use the various utilities that the techbook had to offer (highlighting, note-taking, speak-text) slightly more frequently than the other groups, possibly enabling these students to have a deeper learning experience as a result when compared to other models of implementation (McFall, 2005). The *depth of use* data backs this assumption up as the 1:3 model had the highest value in this category and was significantly different than the other groups. Students *overall* gave the techbook a 3.84 mean score on a Likert scale of 1 to 6, indicating that their experience with the techbook was just slightly above average in nature. The aspects of the techbook that revolve around its development and structure, such as the organization of the site and the content were rated positively by student and teacher alike—all with EI framework values very close to 4 or above. Students and teachers both felt that the content was engaging, at the appropriate age and learning level, though students indicated that the content was not very relevant to their lives with a below average mean value of 3.46. These aspects all point to the techbook being suitable as a tool to be used within classrooms of Joint School District No. 2, though how it is being used within the classroom must begin to be analyzed.

The positive values found for the 6th grade effect size changes (when compared to control group EOC means) indicate the possibility of a greater degree the resource's alignment to the district's curriculum than that of the 8th grade Geography course. When students are grouped by individual teacher, statistical differences between the groups are no longer found. This indicates that most of the variability is with each teacher-- how closely they teach within the curriculum and how they use the techbook or other tools. One question that arises is why students who used the techbook more frequently grew less than groups who used it infrequently. Certainly further study and analysis is needed in this area to validate these findings before any generalizations about relationship between assessments and this or other techbooks can be made.

Engagment and use of the techbook in different models. Differences within the usage data shows that the 1:1 model had individual students working within the techbook at much higher levels (M=17.3, SD=3.73 as number of logins) versus the other groups. There was however, a negative

correlation between the amount of use determined through logins and accessed features, and the overall EI value given by students within the study (r= -.21). This indicates that the effectiveness of this media decreased over the course of the semester especially for those students who were using it the most (1:1 model). Though previously published research, as well as studies conducted within Joint School District No. 2, indicates that students indeed can be engaged through the use of technology it seems that how these forms of media are used within the classroom is of the most importance. Evidence for this is seen through all aspects of the survey data. The student engagement with the technology was amplified at the onset of the study, especially with the 1:1 and 1:3 models. There are continual claims by the teacher supplemental model, both by teacher and student, speaking to the need and want of more technology to most effectively implement the techbook. As noted above, the statistically significant negative relationship between the amount of techbook use and overall effectiveness of the platform raises a question as to whether simply adding more technology to the classroom is the answer. Though these correlations are all small in nature, they give an indication that students are becoming disengaged with the techbook over the course of time. This is also dependent on how the techbook is being used within the classroom—as the number of video clips watched showed a positive correlation with EI value (though this was non-significant). The conclusions drawn from this analysis are that if the techbook is used simply as an online textbook or "DVD player" as one teacher put it, engagement will decrease over time. In fact, the observation that the 1:1 model students rated the techbook lowest in EI value indicates the possibility that even with technology at a maximum within the classroom, the techbook still falls short in engaging students and developing deep learning—unless it is used in innovative ways. This matches the previous research on techbooks which speak to the need to transform the techbook and more specifically *how it is used*, to "avoid the replication of the paper textbook" as it this becoming an "increasingly irrelevant" form of media (McFall, 2005). Student technology values indicate that the variety of tools and presentations enabled by the online techbook allow students access to videos and online clips that engage them more than typical textbooks (Vernon, 2008). Additionally, the use of techbooks note-taking, highlighting, and speak-text features could allow students to work deeply within the learning material

(McFall, 2005). Statements by some of the teachers indicating that the techbook "kept students engaged and helped struggling readers keep up" verify this claim. The lack of student construction of knowledge and deep learning indicated by students within the study could be in large part the result of how the techbook is being used within the classroom. Evidence for this is seen in the low utility through technology values- average to below average for students and far below average for teachers. This is an indication that much of what the previous literature states is positive about online learning, the tools and utilities (note-taking, highlighting, speak-text), are not being used to their full potential (and in many cases are not being used at all). Additionally, though the content is seen by students to be engaging, it is not seen to be relevant by these same students as seen by the mean value of 3.46. Previous research states that this relevance can be one of the greatest benefits of techbook use for students and their learning. Shutes & Petersen (1991) have shown this relevance to increase the overall effectiveness of the techbook for students. On the other hand, teachers within the study see the content as relevant (mean of 4.40), indicating that teachers may not be using pedagogy that truly enriches the information learned from the techbook and makes these connections for their students. In other words, if the techbook is used in traditional ways through the pedagogy chosen, students begin to see this tool simply as an online "book" decreasing the impact of the technology.

It seems from the data that professional development surrounding successful research-based methods of using the techbook effectively may be necessary to gain the full value and potential for students. Again, this is substantiated through the teachers' very low values (mean of 2.88 overall) for expected student increases in learning outcomes through techbook use—indicating that this is no silver bullet. This idea points to the argument that the teacher plays the greatest role in the learning process. In fact, the teacher supplemental model had many of the highest ratings of use by both teacher and student in overall effectiveness (though this was not significantly different than the other models). The teacher supplemental model was seen as an adequate teacher *resource* for whole class demonstration though there was nearly no techbook use for homework assignments by these teachers—in fact there was very little techbook homework assigned by any of the participants. This was at least in part due to many concerns

involving student access to technology at home and issues of fairness that arise as a result of this. This could, in part, have played a role in the low usage type values found on the survey showing students who did not use the techbook at home to look up interesting information or to show family and friends information. Furthermore, many student comments were made concerning internet access within the school buildings and slow download speeds. This frequently caused buffering, slow page navigation, and even termination of the videos and the entire webpage in some cases. As this "technology" aspect correlates highly with the overall perception of effectiveness of these tools, bandwidth is certainly something that needs to be taken into consideration.

Implications for Joint District No. 2. The data show that how particular teachers use the techbook plays a very large role in how students interact and therefore perceive this tool. If the techbook is used simply as an online textbook, with students reading and working through the information without interaction and personal connection through relevance and pedagogy, then outcomes may be similar to that of traditional textbooks. The cost comparison of the techbook compared to traditional textbooks must certainly be taken into consideration as these decisions are made if no real outward benefit is seen simply by the use of the online textbook- without the investment of time and money necessary for successful implementation. Additionally, all but one teacher stated that if used only as a *teacher supplemental model,* they would not likely use the techbook as an integral part of their teaching. This indicates that implementation of techbooks into our classrooms may have to be an investment in technology as well.

What is not being measured by this study however, are the "21st Century" and "College and Career Readiness" skills that may be imparted to students as a result of their use with the devices. It could certainly be said, however, that if the pedagogy used is traditional, the outcomes will most likely be traditional. It is therefore imperative that teachers are given ample professional development in proven methods of online and techbook-based learning revolving around these 21st Century skills. These teaching methods do not solely lend themselves to educational technology, but rather center around constructivist-based and student-centered learning. Examples of this can be seen in such pedagogy as of

problem-based learning scenarios (PBLs), Socratic Seminars, and real research based on student interest—all of which can be accomplished to greater degrees of success and engagement through the use of the technology. The drive-by methods of teacher training based on webinars with little to no time for teachers to process, practice, share, and incorporate new methods associated with the technology will lead to less-than-ideal outcomes when, in fact, technology could be used to fully engage and enrich our teaching.

Conclusions. The online techbook, if used to its fullest capacity, could be an effective and highly engaging instructional tool. It is, as shown by this research, a tool that must be used properly to achieve its full potential. Research by such authors as Donaldson (2006), Elmore (2008), and Fullan (2007), speak to the need of targeted and sustained professional development in order to truly allow teachers to incorporate and begin to use new techniques and ideas within their classrooms. Integration of techbooks into our classrooms is an example of just this phenomenon. Teachers will need sustained training accompanied by the time to process, collaborate, and incorporate successful 21st Century methods of techbook implementation within their individual classrooms. Additionally, a major concern among teachers is the assessment methods used to measure their outcomes. Assessment methods may need to be reconsidered as many teachers within the study explained their concern over trying new and innovative techniques while also being held accountable to measures developed under the current system. This study revealed that it may be increasingly difficult to ensure that teachers are implementing these new and innovative techniques with fidelity if they are trying to meet what they perceive as two sets of standards.

Developing 21st Century teaching using 21st Century tools will certainly take time and should not be thought of as a success or failure based upon a single semester of implementation. In order to fully realize the potential of these 21st Century tools further professional development for these teachers is needed. Discovery Education has incorporated two professional development days for every 500 student licenses bought into their contract. Our recommendation is that, in addition to these teachers being trained on the program and its features, these teachers will need access to training on successful pedagogy that incorporates the technology-based techbook and other 21st Century methods of teaching.

Additionally, students will also need time to be inculcated into the 21st Century classroom in order for them to gain acceptance of these newer types of pedagogy and tools. Research has shown that the students themselves can determine the pedagogy a teacher is willing and able to implement (Harm, 2013; Staton and Hunt, 1990; Zeichner and Gore, 1990). Further study within Meridian Joint District No. 2 can and should focus on using techbooks within the classroom in particular, but also on how 21st Century classrooms mandate that we think and teach differently. Since the techbook is a tool, not a complete educational process, teachers need to find and develop the "best practice" for this resource's implementation within our classrooms. This will involve time and patience. Sustained teacher training involving 21st Century methods of student-centered learning, using 21st Century tools is essential for this process to be successful.

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Appendix A- Techbook Survey Factors and Questions- Student

Analysis based, in part, upon textbook adoption rubric and online education Effectiveness Index (EI) by Mashaw (2012)

Organization (*n*=5)

Accessing Information (n=4)

The techbook was well organized which made finding information easy.

I found it easy to find information using this online techbook.

I found myself spending a lot of time searching for what I needed within the techbook

The organization of the techbook was confusing

Structure toward Learning (n=1)

I liked the use of the 5 E's (Engage, Explore, Explain, Elaborate, Evaluate) to organize information within the techbook.

Technology (*n*=4)

Website and Software Use (n=1)

The links within the techbook were easy to navigate.

Variety through Technology- Impact on Engagement and Learning (n=3)

The variety of online presentation tools (videos, diagrams, readings) kept my interest.

The variety of online presentation tools (videos, diagrams, readings) helped me learn information.

I enjoyed using the online techbook over a regular textbook because it involved using a computer or ipad mini.

Utility (*n*=10)

Features- How often Used (n=4)

I used the highlighting feature often.

I used the note-taking feature often to organize information while using the techbook.

I used the speak-text feature often.

Utility Continued..

I found myself wanting to watch the videos presented by the techbook.

Features- Impact on Learning (note taking, highlighting, speak-text (n=6)

The note-taking feature helped me learn.

The highlighting feature of the techbook helped me learn.

The speak-text feature helped me understand information that was in the reading.

The videos embedded within the techbook helped clarify what I was reading.

I used the videos often to learn the subject more in-depth.

I used the speak-text feature when I did not feel like reading.

Content (*n*=8)

Engagement (n=3)

I found the information presented in the techbook to be very interesting.

The techbook's content inspired me to learn more about the subjects.

I enjoyed what I learned from the techbook.

Relevance (n=3)

The content of the techbook was connected with my life

I noticed concepts in the techbook outside of class.

The videos presented throughout the lessons were helpful in showing the real-life issues associated with this course.

Appropriateness to Level of Student (n=2)

I understood what was presented in the techbook.

I thought the information from the techbook was difficult to understand.

Usage (*n*=12)

Enjoyment and Engagement (n=6)

I found myself looking up information on my own that was not directly related to what my teacher told me to find.

I used the techbook more than I would have used a "regular" textbook.

I found myself wanting to use the techbook because of the interesting information.

I think the techbook was much more enjoyable to use than a "regular" textbook.

I used the techbook only when something was assigned to me by my teacher.

I showed information from the techbook to my friends and/or family outside of school.

Types of Use (n=3)

I used the techbook when I was at home for homework.

I used the techbook at home to look up things that I was interested in.

I typically used the techbook with a group of other students.

"Depth" of Use (n=3)

I read most of what was presented in the techbook word-for-word.

I tended to skim the techbook to find the information that I needed.

I found myself clicking "next" quite often to get through unneeded information.

General (*n*=8)

Techbook Vs. Textbook (n=1)

If given the choice, I would choose a techbook over a "regular" textbook.

Overall Rating of Techbook (n=3)

I liked using the techbook.

I was very happy with all aspects of the techbook.

My overall rating for the techbook would be.

Demographic and Usage Questions (n=4)

My grade in this course will likely be a(n):

I enjoy reading on my own time.

On average per week, how many hours did you spend using the techbook?

Please type any thoughts you have concerning your use of techbooks in the future.

Appendix B- Techbook Pilot Study- Teachers Survey

Organization (*n*=7)

Teacher Planning (n=6)

The resource materials in the techbook were well organized and easy to use.

Objectives were clearly stated in the techbook and they matched what I needed within my classroom.

The content was well organized for teachers to easily access information.

The use of the 5 "Es" made lesson planning easier.

The order of lessons was logical and made sense.

The organization of the techbook made my job easier.

Student Learning (n=1)

I think students were easily able to navigate information within the techbook.

Technology (*n*=5)

Ease of Use (n=2)

The program/website/platform was easy for students to use.

The links within the site were designed well and were easy to navigate

Variety and Engagement (n=3)

The variety of presentation tools kept student interest.

Students liked the website/platform, it made their learning easy.

The variety of presentation tools helped students learn the information.

Devices (*n=5)*

The devices my students used to access the techbook operated well for the task.

The wireless access in our school was sufficient to meet the needs of the techbook.

I would say the device (ipad, ipad mini, laptop, desktop) that we used was the "correct" tool for techbook implementation.

I encouraged my students to bring in headphones.

There was “too much going on” in my classroom as a result of the technology, the classroom became hectic.

Utility (*n*=5)

The students used the index, table of contents, glossary to locate needed information often.

The students’ use of the highlighting feature of the techbook helped them learn the material.

The students' use of the speak-text function helped them to understand the reading material.

The use of the note-taking feature of the techbook helped students in find and remember important information.

The speak-text function of the techbook discouraged students from actually reading the material.

Content (*n*=14)

Teacher Resources (n=5)

I could use this techbook as the primary resource for my class.

The techbook provided an ample amount of resources for adapting to learners' individual needs (handouts, aids, charts).

The techbook had assessments, tools and ideas for gathering data on student achievement.

The techbook's connection to primary sources enabled my students to understand the information to a greater depth.

The techbook's use of primary sources made my students want to learn more about the subject.

Match to Curriculum (n=4)

The Common Core State Standards (CCSS) were incorporated within the techbook.

The techbook had relevant information that matched our curriculum.

The techbook greatly supported what I taught in my classroom.

The language and reading level was appropriate for my students.

Relevance of Information (n=3)

The lessons were linked with other subject areas.

My students were engaged by the content of the techbook.

The techbook content is up to date and relevant.

Depth of Learning (n=2)

The lessons and content encouraged higher-level thinking among my students.

The lessons and content made my students deeply explore particular subjects.

Usage (*n*=5)

In your estimate, how often per week did your students use the techbook in the following ways?

Group, individually, as a demonstration, at home, in class

On a regular basis my students used many of the learning tools that were part of the techbook (highlighting tool, note-taking tool, speak-text).

Overall (*n*=9)

If you had to choose between only techbook and a "regular" textbook, which would you now prefer to teach with?

I expect to see an improvement in my students' classroom grades as a result of their techbook use.

I expect to see an increase in my students' End of Course exam grades (EOC) as a result of their techbook use.

My students were more engaged as a result of the techbook, in comparison with a "traditional" textbook.

Demographics (years of teaching, w/ Meridian, in current position)

How many times would you estimate you gave students an assignment that required them to use the techbook at home?

What was good about the techbook?

What areas of your curriculum was the techbook lacking?

What difficulties did you have with the techbook?