EFFECTIVENESS OF BLENDED LEARNING

IN THE MATHEMATICS CLASSROOM

Approved: __Dale Henze_____ Date: __July 29, 2016_____

EFFECTIVENESS OF BLENDED LEARNING IN THE MATHEMATICS CLASSROOM

A Seminar Paper

Presented to

The Graduate Faculty

University of Wisconsin-Platteville

In Partial Fulfillment of the

Requirement for the Degree

Masters of Science

in

Education

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by

Jesse Gleason

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Abstract

EFFECTIVENESS OF BLENDED LEARNING

IN THE MATHEMATICS CLASSROOM

Jesse Gleason

Under the Supervision of Joan Riedle,

Professor of Psychology at the University of Wisconsin-Platteville

As technology takes a greater role in our daily lives the use of technology in teaching and learning continues to evolve. There are many questions surrounding the proper use of technology within the learning process. Blended learning is a method of teaching and learning in which traditional face-to-face learning through direct instruction is combined with online learning activities such as videos and online forum discussions supplemented with small group discussion within the classroom setting. At the time of this study there was little information available regarding the effectiveness of blended learning within a secondary classroom. This study shows a direct comparison between a blended learning classroom and a traditional direct instruction classroom. The results of this study show no statistical difference between a traditional direct instruction and a blended learning environment; there are many qualitative benefits to blended learning that traditional instruction does not provide.

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CHAPTER I: INTRODUCTION

Can a blended learning environment consisting of online lessons and face-to-face activities increase student achievement and retention of learning in high school mathematics?

As our society shifts toward greater use of technology in our daily lives, educators have begun to use technology in an educational setting. Arguments have been made that a blended learning environment can increase student achievement while decreasing the cost of districts providing education. However, the results of studies on student achievement have been inconsistent, with several studies finding a statistical advantage to blended learning (e.g., Bottage, 2014; Yasar Kazu & Demirkol, 2014) while others have found no statistical difference between blended learning and face-to-face traditional learning (Cakiroglu, 2012; Demirer & Sahin, 2009; Siko, 2014). There do not appear to be any negative effects of blended learning on students' academic achievements. However, Cakiroglu raises some concern regarding students' retention of material, reporting a higher rate of retention for those students taught in a traditional face-to-face classroom when measured using a delayed post-test.

It is critical that students not only learn course content, but also that these students retain and apply their knowledge. I designed and conducted a study on the effect of blended learning on students' academic achievement and retention of learning.

Statement of the Problem

Does a blended learning environment have a positive effect on students' immediate academic achievement?

Does a blended learning environment have a negative effect on students' long term retention of learning as found by Cakiroglu (2012)?

Definition of Terms

Blended learning: For the purpose of this study blended learning is education through a combination of traditional face-to-face teaching methods along with the use of online learning through a flexible media that can be adjusted to fit student needs.

Face-to-Face or **traditional learning:** This is a traditional classroom setting in which a teacher and students are engaged in the education process.

Delimitations and Limitations of the Research

Delimitations of this study include:

1. Both blended learning and traditional direct instruction students were enrolled in an advanced algebra students at Cuba City High School. I have chosen this group as participants in the study in order to allow me to create a control group using a second section of the same class.
2. Data for both blended learning and traditional direct instructions groups was collected during a four week academic unit. This time frame was chosen in order to gather information on the effectiveness of blended learning in regard to students' academic achievement and retention of learning. While a longer study may have yielded more data, it was my intention to use the findings of this study in order to implement a quick change in the teaching/learning practices in my classroom.

Limitations of this study include:

1. The group of study was a relatively small group of students. These students were not randomly assigned to control and research groups due to pre-established scheduling requirements within the school.

Method of Approach

Advanced algebra students at Cuba City High School are separated into three class sections in order to accommodate class size and scheduling needs within the district. One of the sections was chosen as a control group and another as the research group. For the purpose of this study, no data were collected on the third group. Data collection consisted of a pretest, post-test, and delayed post-test for each of the sample groups. The independent variable of this study was the method in which material was presented to students in the two groups. While the control group continued with traditional teaching methods, the research group was trained to use and taught using a blended learning technique. The blended learning environment consisted of two to three days per week using online learning tools with the remaining days used for traditional face-to-face learning. Online tools consisting of instructional videos as well as online course management software were used. For more information please refer to Appendix A (IRB approval letter) and Appendix B (project materials).

CHAPTER II: REVIEW OF THE LITERATURE

Research Question

Can a blended learning environment consisting of online lessons and face-to-face activities increase student achievement and retention of learning in high school mathematics?

Discussion of Prior Research

Alijani, Obyung, and Yanjun (2014) discussed the need for different educational practices in order to meet the needs of all students. In modern times there are more opportunities for the use of technology in education. One such instance is that of blended learning in which students participate in educational practices both online and in the classroom. Alijani et al. (2014) distributed surveys to 186 teachers in math, reading, and English. Seventy percent of these teachers responded with usable survey data. Teachers' opinions showed a belief in great potential, yet still contain skepticism of blended learning at the current time. According to Alijani et al., 94% of respondents believe that blended learning has greater potential for student success than traditional learning, while 48% agree that blended learning is a higher quality instructional method than traditional learning.

In their study, Alijani et al. (2014) described a shift in our culture and a need for different instructional methods in order to meet the learning needs of all students in our communities. Technology offers new tools to be used in education, yet the effectiveness of these tools and how to best use technology in education has yet to be determined. One approach is that of a blended learning environment in which material in a classroom is learned through the use of both traditional teaching methods as well as through online media. This method is believed to assist with the ineffectiveness of traditional learning in promoting student participation while still

maintaining the interaction between learners that distance learning tends to stifle (Alijani et al., 2014).

There are many different ways one can measure how effective a learning environment is, and the findings of the immediate academic effectiveness of blended learning when compared to traditional face-to-face learning have been mixed. Several studies have found a statistical advantage to blended learning (e.g., Bottage, 2014; Yasar Kazu & Demirkol, 2014) while others have found no statistical difference comparing blended learning and face-to-face traditional learning (Cakiroglu, 2012; Demirer & Sahin, 2013; Siko, 2014).

There do not appear to be any negative effects of blended learning regarding students' immediate academic achievements. However, we may wish to consider other measures of effectiveness of education. The goal of education may be to instill knowledge, it is also hoped that this knowledge will be retained over time. There is little information concerning the effectiveness of blended learning on student retention of knowledge over an extended period of time. Cakiroglu's findings raised a concern regarding students' retention of learning when taught using a blended learning environment when compared to retention of learning of students taught in a traditional face-to-face classroom (2012). While Cakiroglu's finding are concerning to future education, one must consider the limitations of the study. One of these is that his study was conducted at the university level. The findings of Cakiroglu's study may not apply to elementary, middle school, or secondary school setting.

Another measure of educational effectiveness is that of application of knowledge. Not only do we strive for students to learn and retain academic knowledge, but also to apply this knowledge to complete tasks. In a 2013 study comparing blended and traditional instruction, Demirer and Sahin found no significant difference in academic achievement of students in a

university course titled Multimedia Design and Production. However, they did find that students learning in a blended learning environment had a greater transfer of knowledge when asked to create educational multimedia projects.

Summary

As education continues to evolve, one possible direction for it to take is that of a blended learning environment. At this time there is much debate on the effectiveness of this educational model and even how the effectiveness of education should be measured. Of the three measures presented (ie., learning, retention, application) education strives to achieve effectiveness in all three; however, which educational model has the greatest effect is yet to be determined. For these reasons this research study is being conducted to look at two of these measures, immediate academic effectiveness and retention of learned knowledge.

Research Questions

Does a blended learning environment have a positive effect on students' immediate academic achievement?

Does a blended learning environment have a negative effect on students' long term retention of learning as found by Cakiroglu (2012)?

CHAPTER III: METHOD

Participants and Setting

My study concerning the effectiveness of blended learning in the mathematics classroom was completed in a mixed ability advanced algebra classroom in a rural high school in Southwest Wisconsin. The high school's student enrollment was 234 students at the time of this study with approximately 97% of these students being Caucasian. Student participants consisted of 20 males and 14 females ranging in age from 15 to 18.

Materials and Procedures

Student achievement data were collected on all participants. Participants were separated into two pre-established groups based on scheduling needs within the school district. During a unit of study, the treatment group was presented material through a blended learning approach while the control group was presented the unit by methods used previously in the classroom.

Prior to the start of the unit students in the treatment group participated in a brief training covering the online learning tools. This training consisted of how to get assistance with classroom topics using online tools as well as how to utilize the course management software. See Appendix B for more detail. The learning environment for the treatment group consisted of two to three days per week implementing online learning tools while the other two to three days per week were conducted in a traditional face-to-face environment. The control group maintained a traditional face-to-face learning environment.

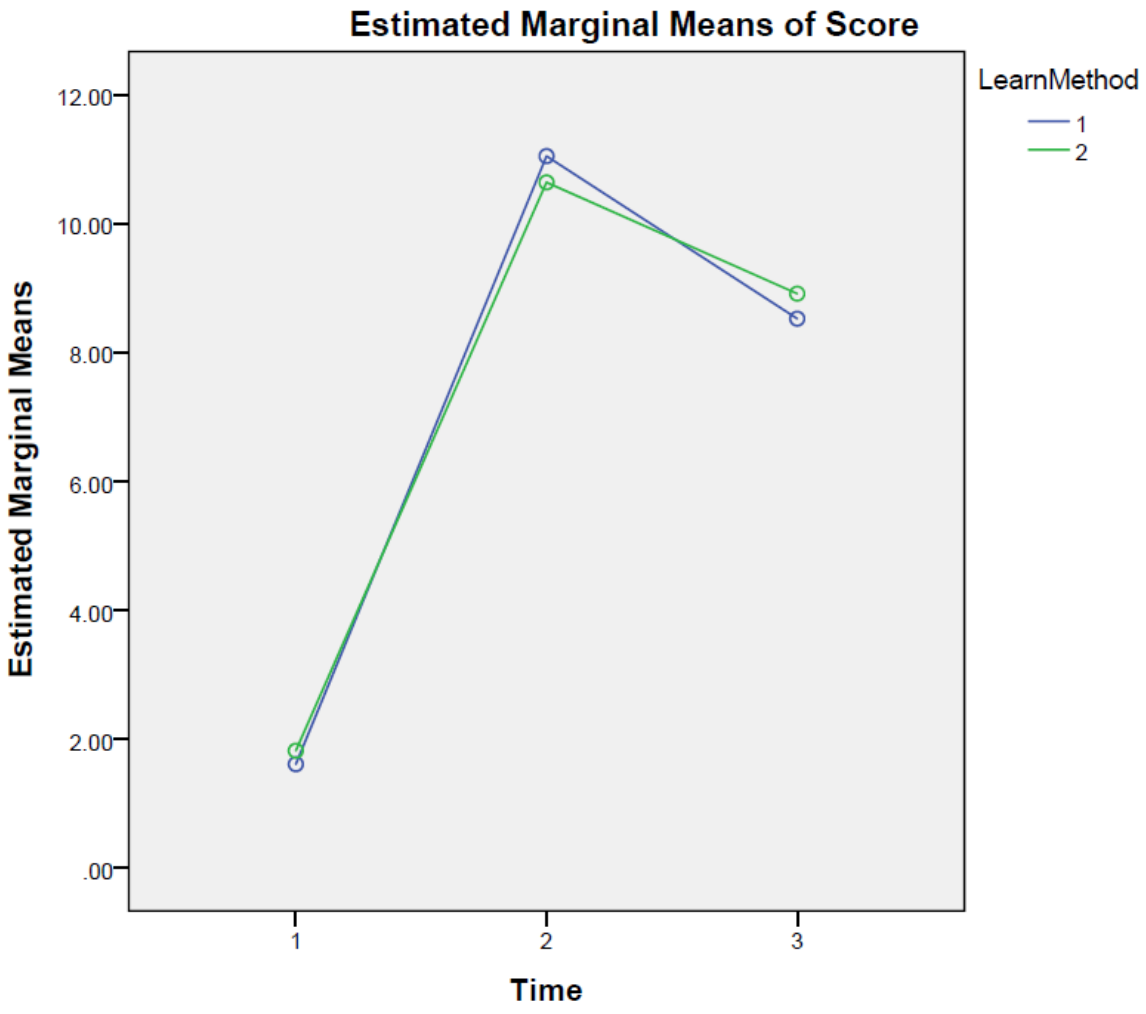
In order to track and compare student growth and achievement in the two sample groups, participants of both groups completed a pretest prior to the beginning of the study to establish a baseline of knowledge. Upon completion of the unit of material participants completed an academically equivalent post-test consisting of similar questions to the pretest asked in a similar

way. These two data points presented a measure of immediate academic achievement and growth for both the treatment and control groups. In order to measure students' retention of learned material a delayed post-test was completed by all participants two weeks after the completion of the initial post-test. Once again, this test was academically equivalent to both the pre and post-tests consisting of similar questions asked in a similar way in order to maintain consistency within the data collection process. These three pieces of data for each participant in both the control and treatment groups were then used to conduct a repeated measure analysis of variance in order to compare the two learning environments presented in the study.

CHAPTER IV: RESULTS

The goal of this study was to examine the impact of a blended learning environment in an advanced algebra classroom when compared to a traditionally taught advanced algebra classroom both within Cuba City High School. The data were analyzed using a repeated measures analysis of variance. Mean scores for the three testing periods are shown below. See Figure 1. In Figure 1 Learning Method 1 represents a blended learning classroom and Learning Method 2 represents a traditional learning classroom. Time 1, 2 and 3 represent testing times of the pretest, post-test and delayed post-test respectively.

Figure 1:



An ANOVA with repeated measures was performed. The main effect of Testing Period was significant, F(2, 64) = 148.08, p < .001, $\eta^2_{partial}$ = .82. This shows that the time of learning had a significant effect on the entire group of participants in this study. When testing the interaction of Testing Period and Learning/Teaching Method, no significance was found, F(2, 64) = 0.19,

p < .83, $\eta^2_{partial}$ = .006. (See Table 1. Tests of Within-Subjects Effects.)

Table 1:

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
TestPeriod	Sphericity Assumed	1290.767	2	645.383	148.077	.000	.822
	Greenhouse-Geisser	1290.767	1.716	752.115	148.077	.000	.822
	Huynh-Feldt	1290.767	1.861	693.686	148.077	.000	.822
	Lower-bound	1290.767	1.000	1290.767	148.077	.000	.822
TestPeriod * LearnMethod2	Sphericity Assumed	1.630	2	.815	.187	.830	.006
	Greenhouse-Geisser	1.630	1.716	.950	.187	.797	.006
	Huynh-Feldt	1.630	1.861	.876	.187	.815	.006
	Lower-bound	1.630	1.000	1.630	.187	.668	.006
Error(TestPeriod)	Sphericity Assumed	278.939	64	4.358			
	Greenhouse-Geisser	278.939	54.918	5.079			
	Huynh-Feldt	278.939	59.544	4.685			
	Lower-bound	278.939	32.000	8.717			

The main effect of Learning/Teaching Method was also not significant, $F(1, 32) = 0.05$, $p = .82$, $\eta^2_{partial}$ = .002. This test shows there was no statistically significant difference between the two learning/teaching methods. (See Table 2. Tests of Between-Subject Effects.)

Based on these results, the questions of this study regarding whether a blended learning environment has a positive effect on students' immediate academic achievement and that a blended learning environment has a negative effect on students' long term retention of learning, must be rejected.

Table 2:

Tests of Between-Subjects Effects

Measure: MEASURE_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Intercept	4298.471	1	4298.471	218.907	.000	.872
LearnMethod2	1.020	1	1.020	.052	.821	.002
Error	628.353	32	19.636			

CHAPTER V: DISCUSSION

As our society and culture continue to embrace technology more and more, there are many questions regarding the use of technology to enhance or even control education. With all of the available uses of technology to enhance learning in the classroom it is undeniable that education is changing to embrace these tools into the learning and teaching experience. The questions asked in this study were focused around some specific technology based teaching and learning tools. A blended learning environment is one step closer to that of a flipped classroom in which students learn independently through the use of technology with a teacher providing guidance along the way. My vision of a blended learning environment is one that combines the use of online learning tools with that of in-class group activities and discussions.

While some studies have found a statistical advantage to blended learning (e.g., Bottage, 2014; Yasar Kazu & Demirkol, 2014) others have found no statistical difference comparing blended learning and face-to-face traditional learning (Cakiroglu, 2012; Demirer & Sahin, 2013; Siko, 2014) and one study by Cakiroglu (2012) found blended learning to have negative effects on student retention of information. All of these findings leave a lot of uncertainty in making decisions to best teaching practices as there has been multiple disagreements regarding the effectiveness of blended learning when compared to traditional direct instruction. I also believe we should consider the dates of these studies to put into perspective the use of technology in a learning environment. As students and teachers become more familiar with the use of technology in teaching and learning we may see stronger effects of blended and online learning tools.

So, does blended learning have a positive effect on immediate learning and does blended learning have a negative effect on long-term retention of learning? The data collected during this

study show no statistical difference between the two learning methods on either immediate or long-term retention of learning.

Providing a blended learning environment is a significant shift in teaching and learning techniques and it takes time. According to Aycock, Garnham, and Kaleta (2002) teachers should allow six months preparation in order to effectively implement a blended learning classroom environment. Some things to consider in this process are students' comfort with online tools for learning purposes as well as the teacher's ability to produce and implement quality online teaching experiences. The school in which this study was performed was a rural district in which the teacher participating was teaching not only the advanced algebra classes in which this study is centered around, but also two other courses. This creates a significant demand on a teacher's preparation for teaching and learning. This is a significant limitation on any shift in teaching methods. Is the change feasible and does the extra work provide a significant benefit?

While this study found no statistically significant difference in these two learning methods, there may be other benefits to the use of a blended learning environment over a traditional learning environment. As more colleges and universities turn to online learning programs, it is important to prepare students for this type of learning environment. A blended learning environment can provide some guidance to this type of learning, building a bridge from a traditional classroom to online learning while providing guidance of proper and beneficial uses of technology-based tools. Blended learning also provides a more flexible environment for learning that can be adapted to meet students' needs in content and time. However, in order to be most effective, proper integration of face-to-face and online learning is essential (Kenney and Newcombe 2011). This can place a great demand of planning on teachers in order transition to blended learning while maintaining highly effective instruction.

Throughout the learning process, student absences often create difficulty in learning. One benefit to student learning in a blended learning classroom is the flexibility of lesson presentation. Online videos give students the ability to learn when they are able within a reasonable time constraint. Not only can they learn with flexibility regarding time, they can take in information at their own pace by pausing and re-watching lessons as needed. A blended learning environment can provide these opportunities while still providing time for important face-to-face learning, group discussions and interactions (Frank, Reich, and Humphreys, 2003).

While this study found no statistically significant result, there were benefits to both teaching and learning methods. While placing a significant demand on the teacher during transition, blended learning provides a balanced learning environment in which students are able to learn course content while continuing to develop skills in the use and proper implementation of technology into their daily lives, a skill that continues to need development and refinement according to Berk (2009).

CHAPTER VI: REFERENCES

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APPENDIX A: IRB APPROVAL LETTER

UNIVERSITY OF WISCONSIN PLATTEVILLE
INSTITUTIONAL REVIEW BOARD

8/31/2015

Jesse Gleason
Sponsor: Dr. Joan E. Riedle
Department of Masters of Science - Education
University of Wisconsin-Platteville

RE: IRB Protocol #2015-16-04

Project Title: Effectiveness of blended learning in the mathematics classroom.

Approval Date: 8/31/2015
Expiration Date: 8/30/2016

Your project has been approved by the University of Wisconsin-Platteville IRB via a Full Board Review. This approval is subject to the following conditions, otherwise approval may be suspended:

1. No participants may be involved in the study prior to the IRB approval date listed above or after the expiration date.
2. All unanticipated or serious adverse events must be reported to the IRB.
3. All modifications to procedures, participant selection, and instruments used (surveys, consent forms, etc) must be reported to the IRB chair prior to their use. Extensive modifications may require full board approval.
4. If the project will continue beyond the expiration date, then the researcher must file for a continuation with the IRB at least 14 days prior to the expiration date. If the IRB approval for this project expires before approval for continuation is given, then a new protocol must be filled out and submitted. Federal guidelines allow for no exceptions to this rule. Any data collected after the expiration date cannot be used in the study.

If you have any questions, please contact the IRB chair at the address below. Include your protocol # on all correspondence.

Sincerely,

Dr. Barb Barnet
Institutional Review Board Chair
Professor, Mathematics Department
Gardner 451
University of Wisconsin-Platteville
(608) 342-1942
barnetb@uwplatt.edu

1 University Plaza | Platteville WI 53818-3099 | www.uwplatt.edu

APPENDIX B: PROJECT MATERIALS

Appendix I

SCHOOL DISTRICT OF CUBA CITY
CUBA CITY COMMUNITY HIGH SCHOOL

JIM BOEBEL, PRINCIPAL
101 North School Street
Cuba City, WI 53807
Phone: 608-744-8888
Fax: 608-744-2324
www.cubacity.k12.wi.us

July 16, 2015

UW-Platteville Leadership Program,
I am writing this endorsement letter on behalf of Cuba City High School. Mr. Gleason has proposed a study involving the students in Cuba City High School. I fully support his plan to implement blended learning in one class and compare it with a traditional class.

Your friend in education,

Jim Boebel
High School Principal
Cuba City School District

PARENT/GUARDIAN CONSENT FORM FOR PARTICIPATION OF HUMAN PARTICIPANTS IN RESEARCH
UNIVERSITY OF WISCONSIN-PLATTEVILLE & CUBA CITY HIGH SCHOOL

1. Purpose: The purpose of this research is to implement a blended learning environment and explore whether blended online learning would or would not be a benefit to student success at Cuba City High School.

2. Procedure: Your child will be asked to complete a pretest, post-test, and a delayed post-test of a mathematical unit in order to study the effects of blended learning on student achievement. PARTICIPATION IS VOLUNTARY AND HE/SHE WILL BE ASKED TO GIVE HIS/HER ASSENT. YOUR CHILD'S NAME WILL NOT BE RECORDED ON THE RESEARCH MATERIALS AND IT WILL NOT BE INCLUDED IN OUR DATA SET OR IN ANY REPORTS ABOUT THE PROJECT. All students will complete the tests and learning experience as part of our regular classwork, but your child's scores will only be included in the data set with your permission.

3. Time Required: Participation is expected to be 6-8 weeks during the fall semester of the 2015 school year.

4. Risks: No short-term or long-term risks are foreseen.

Benefits: Your child will have an opportunity to learn in a blended classroom. Blended learning is generally accepted to be more flexible and more easily personalized for students. This exposure and training in how to use a blended learning environment will help expose your child to online learning tools and better prepare them for future experiences using similar platforms.

5. Your Rights as the Parent of a Student Participant: The information gathered in this study will be confidential. Data or summarized results will not be released in any way that could identify you or your child. If your child would like to withdraw from the study at any time, he/she may do so without penalty or repercussions. The information collected from your child up to that point would be excluded from my data set. If you have any questions afterward, please ask:

Jesse Gleason
High School Math Teacher, Cuba City School District
Graduate Student, School of Education, University of Wisconsin-Platteville
608-744-8888
jesse.gleason@cubacity.k12.wi.us
Faculty Sponsor: Joan Riedle (riedlej@uwplatt.edu)

Once the study is completed, you may request a summary of the results by contacting me (Jesse Gleason) or Principal Jim Boebel.

6. If you have any questions about your child's treatment as a participant in this study, please call or write:

Barb Barnet Chair of the UW-Platteville IRB (608) 342-1942 barnetb@uwplatt.edu	or	Jim Boebel Cuba City High School Principal 608-744-8888 jim.boebel@cubacity.k12.wi.us

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I have read the above information and (check one):

____ DO give consent that my child's test scores be included in Mr. Gleason's data set.

____ DO NOT give consent that my child's test scores be included in Mr. Gleason's data set.

Please print your child's name (First, Middle, Last):_____

Please print your full name (First, Middle, Last): _____

Please sign: _____ Date: _____

Then return this completed form to Mr. Jesse Gleason by_____

PARENT/GUARDIAN CONSENT FORM FOR PARTICIPATION OF HUMAN PARTICIPANTS IN RESEARCH
UNIVERSITY OF WISCONSIN-PLATTEVILLE & CUBA CITY HIGH SCHOOL

1. Purpose: The purpose of this research is to implement a blended learning environment and explore whether blended online learning would or would not be a benefit to student success at Cuba City High School.

2. Procedure: Your child will be asked to complete a pretest, post-test, and a delayed post-test of a mathematical unit in order to study the effects of blended learning on student achievement. PARTICIPATION IS VOLUNTARY AND HE/SHE WILL BE ASKED TO GIVE HIS/HER ASSENT. YOUR CHILD'S NAME WILL NOT BE RECORDED ON THE RESEARCH MATERIALS AND IT WILL NOT BE INCLUDED IN OUR DATA SET OR IN ANY REPORTS ABOUT THE PROJECT. All students will complete the tests and learning experience as part of our regular classwork, but your child's scores will only be included in the data set with your permission.

3. Time Required: Participation is expected to be 6-8 weeks during the fall semester of the 2015 school year.

4. Risks: No short-term or long-term risks are foreseen.

Benefits: Your child will have an opportunity to assist in determining the best learning environment for students here at Cuba City High School. Your child will be taught with my usual teaching methods. His/her classroom will experience little to no change during the time of the study.

5. Your Rights as the Parent of a Student Participant: The information gathered in this study will be confidential. Data or summarized results will not be released in any way that could identify you or your child. If your child would like to withdraw from the study at any time, he/she may do so without penalty or repercussions. The information collected from your child up to that point would be excluded from my data set. If you have any questions afterward, please ask:

Jesse Gleason
High School Math Teacher, Cuba City School District
Graduate Student, School of Education, University of Wisconsin-Platteville
608-744-8888
jesse.gleason@cubacity.k12.wi.us
Faculty Sponsor: Joan Riedle (riedlej@uwplatt.edu)

Once the study is completed, you may request a summary of the results by contacting me (Jesse Gleason) or Principal Jim Boebel.

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Barb Barnet Chair of the UW-Platteville IRB (608) 342-1942 barnetb@uwplatt.edu	or	Jim Boebel Cuba City High School Principal 608-744-8888 jim.boebel@cubacity.k12.wi.us

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I have read the above information and (check one):

____ DO give consent that my child's test scores be included in Mr. Gleason's data set.

____ DO NOT give consent that my child's test scores be included in Mr. Gleason's data set.

Please print your child's name (First, Middle, Last):_____

Please print your full name (First, Middle, Last): _____

Please sign: _____ Date: _____

Then return this completed form to Mr. Jesse Gleason by_____

Appendix III

STUDENT ASSENT FORM FOR PARTICIPATION IN RESEARCH
UNIVERSITY OF WISCONSIN-PLATTEVILLE &
NAME OF CHILD'S SCHOOL/ORGANIZATION

Dear Advanced Algebra Student,

We want to provide the best education possible to you and to future students. Therefore, we are conducting this research project. You are invited to participate in a research project comparing the effectiveness of blended learning environment to a traditional learning environment in a math classroom.

The purpose of our survey is to determine if blended learning is more or less effective at increasing student achievement and retention in mathematics.

You are being asked to participate in this study because, as your teacher, it is necessary to assess your reasoning and mathematical understanding. I would like to use some of your test scores, after removing your name from them, in my study.

Participation in this study will have absolutely no impact on your grades. The information gathered in this study will be used to help make Cuba City High School a better learning environment for you and your classmates.

Your parents have already given permission for me to include your test scores in our research data and we are hoping that you will also agree. Please inform either me or Mr. Boebel if you do not want your test scores included in my data.

Sincerely,
Jesse Gleason
High School Math Teacher, Graduate Student in Education
University of Wisconsin-Platteville
Phone Number: 608-744-8888
Email: jesse.gleason@cubacity.k12.wi.us

Jim Boebel
Cuba City High School Principal
608-744-8888
jim.boebel@cubacity.k12.wi.us

If you have any questions about your treatment as a participant in this study, please call or write either of us or contact:

Barb Barnet
Chair of the UW-Platteville IRB
(608) 342-1942
barnetb@uwplatt.edu

Cuba City High School: Blended Learning vs. Traditional Learning

Blended

Student	Pretest	Post-test	Delayed Post-test
B1	3	15	14
B2	1	5	7
B3	4	12	10
B4	0	5	8
B5	4	16	13
B6	3	15	8
B7	0	8	8
B8	5	18	14
B9	2	6	7
B10	3	11	7
B11	1	9	8
B12	0	6	7
B13	4	15	13
B14	0	10	6
B15	0	11	7
B16	1	14	6
B17	1	12	7
B18	2	9	7
B19	2	13	9
B20	0	14	7
B21	0	5	6
B22	0	8	7
B23	0	12	8
B24	2	14	10
B25			

Traditional

Student	Pretest	Post-test	Delayed Post-test
T1	3	16	15
T2	1	5	2
T3	1	15	11
T4	2	8	11
T5	2	9	5
T6	2	8	7
T7	1	7	7
T8	3	16	9
T9	4	18	13
T10	0	6	10
T11			
T12			
T13			
T14			
T15			
T16			
T17			
T18			
T19			
T20			
T21			
T22			
T23			
T24			
T25			

Appendix V-Sample Problems from Pretest

1.) $x^2 - 7x - 30 = 0$

2.) $x^2 - 19x + 88 = 0$

3.) $x^2 - 15x + 36 = 0$

4.) $20x^2 + 46x + 24 = 0$

5.) $-12x^2 + 14x - 2 = 0$

6.) $-25x^2 + 0x + 64 = 0$

7.) $-49x^2 + 49x - 6 = 0$

8.) $-25x^2 + 20x + 5 = 0$

9.) $-12x^2 - 52x - 35 = 0$

10.) $24x^2 - 28x + 8 = 0$

11.) $35x^2 + 30x - 5 = 0$

12.) $11x^2 + 7x + 1 = 0$

13.) $-11x^2 + 7x + 3 = 0$

14.) $3x^2 - 12x + 3 = 0$

Appendix VI-Blended Learning Training outline

1. Khan Academy account set up:
    a) Teacher will send email to all students inviting them to join a class on Khan Academy.
    b) Students will take Khan Academy's knowledge base test.
    c) As a group explore video aids in Khan Academy.
2. Google Classroom:
    a) As a group, all students will log in to Google Classroom.
    b) Familiarize students with news feed and discussion area.
        i) Instructional videos will be posted in this area.
    c) Complete a "test" assignment together.
        i) Daily assignments will be posted and submitted using Google Classroom. All work should still be shown therefor daily assignments may need to be photographed or scanned in order to be submitted online.
3. Class webpage:
    a) Familiarize students will class webpage and the content available to assist students.
4. Class schedule:
    a) Weekly schedule for three to four week solving quadratics unit will consist of two days large group discussion and some direct instruction along with two days of independent learning using online resources such as videos and small group projects. The fifth day each week will be used for individualized learning through Khan Academy as well as reflection and effective use of online tools.

Appendix VII- Sample Problems from Post-test

1.) $x^2 - 15x + 54 = 0$

2.) $x^2 - 11x + 24 = 0$

3.) $x^2 - 20x + 99 = 0$

4.) $-7x^2 - 24x + 16 = 0$

5.) $21x^2 + 31x - 42 = 0$

6.) $20x^2 - 45x + 25 = 0$

7.) $42x^2 + 26x + 4 = 0$

8.) $24x^2 + 37x + 14 = 0$

9.) $-21x^2 - 4x + 1 = 0$

10.) $-40x^2 - 43x + 6 = 0$

11.) $12x^2 - 40x + 12 = 0$

12.) $7x^2 + 8x - 10 = 0$

13.) $4x^2 + 13x + 10 = 0$

14.) $4x^2 + 7x + 2 = 0$

Appendix VIII- Sample Problems from Delayed Post-test

1.) $x^2 - 9x + 0 = 0$

2.) $x^2 - 15x + 54 = 0$

3.) $x^2 - 16x + 55 = 0$

4.) $-40x^2 - 30x + 10 = 0$

5.) $16x^2 + 20x - 14 = 0$

6.) $24x^2 + 13x - 2 = 0$

7.) $16x^2 + 38x + 12 = 0$

8.) $32x^2 + 40x + 8 = 0$

9.) $-6x^2 + 25x - 25 = 0$

10.) $25x^2 + 55x + 28 = 0$

11.) $-10x^2 + 18x + 4 = 0$

12.) $2x^2 + 10x + 1 = 0$

13.) $6x^2 - 6x - 8 = 0$

14.) $6x^2 + 13x + 7 = 0$