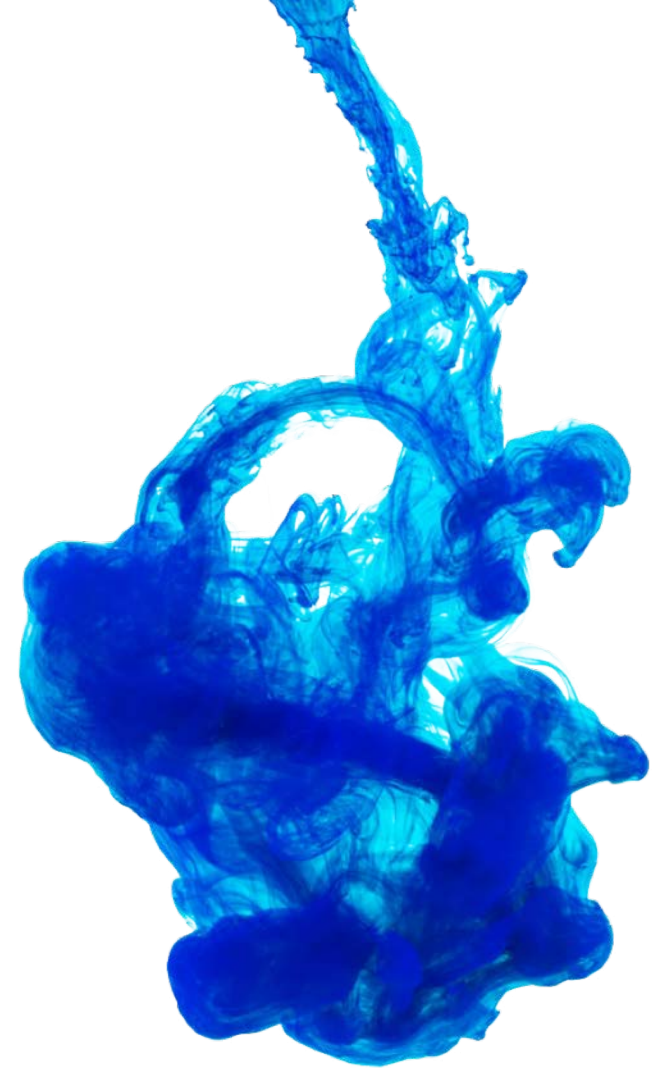


Investigating the Effect of a Curriculum-Embedded Augmented Reality
Game Within an Early Elementary Social Studies Curriculum and its
Influence on Student Experiences, Learning Outcomes, and Teacher
Instructional Practices

Julie Oltman
Dissertation Defense
May 2, 2018



Thank you.

Ready, Set, GO!

- For the sake of time, I am going to fly by some slides.
- I am happy to go back and review anything during the Q&A!



Today's Strategy

- Context for the study
- Building a curriculum-embedded game
- The study
- Analysis, results, & findings
- Implications
- Future lines of inquiry
- Q & A



<https://lastbossgaming.com/2018/02/17/starting-the-slow-video-game-movement-savoring-the-adventure/>



Context for the study

Game-based learning



- GBL has entered the educational mainstream & is considered a legitimate pedagogical approach.

(Horizon Reports 2012 & 2016; Takeuchi & Vaala, 2014)

- Research to date shows that well designed & implemented games “work”. Students can learn from games.

(Dunleavy, Dede, & Mitchell, 2009; Gee, 2003; Klopfer, Osterweil & Salen, 2009; McGonigal, 2011; Prensky, 2006; Squire & Barab, 2004; Steinkuehler & King, 2009)



BUT...There is little GBL research that explores....

- Young learners
- History games
- Curriculum-embedded GBL
- **It's time to jump the gap!**



http://www.dreams.metroeve.com/wp-content/uploads/2017/04/dreams.metroeve_chasm-dreams-meaning.png



Why games?

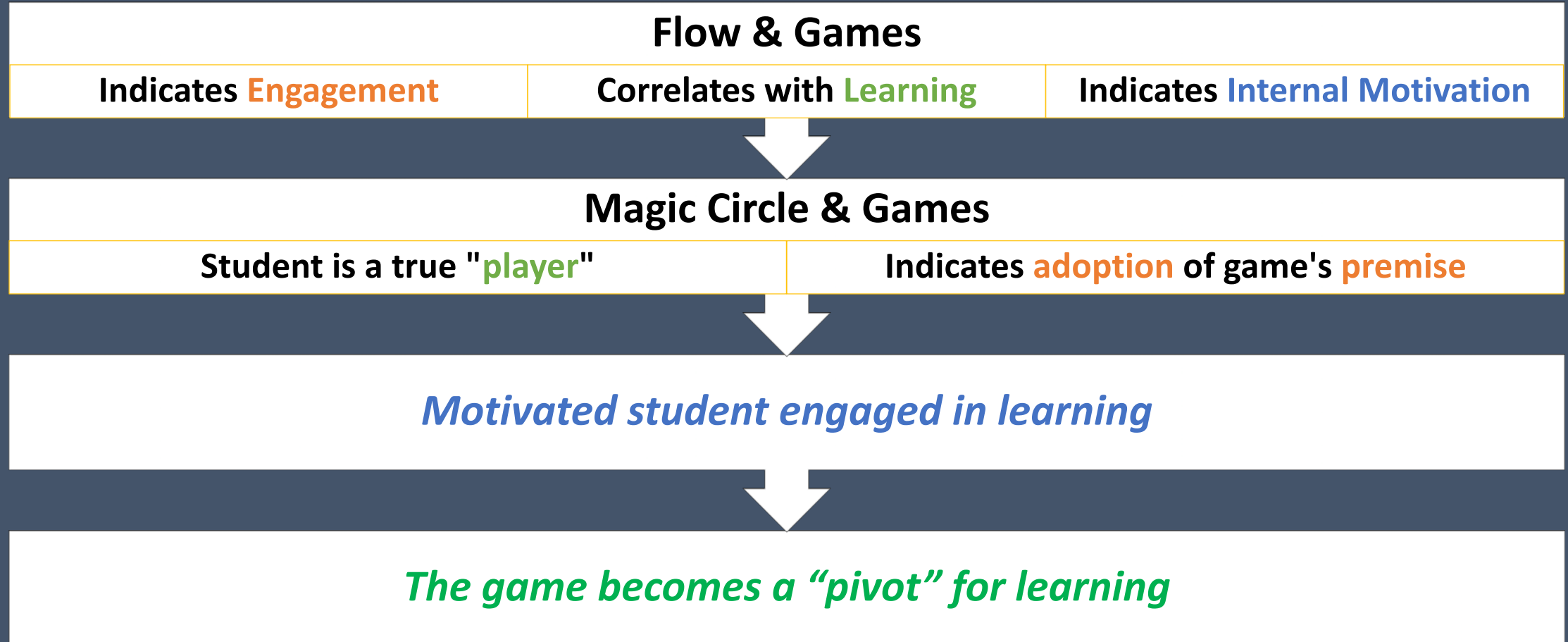
- Motivating
 - Learning vs Recreational
- Affordances for recreation...same affordances for learning?
- GBL gaining in popularity
- Necessary caveat:
 - Diverse means: what kind of game?
 - Diverse ends: what kind of learning?

Learning Theory & Games

- Can match different game genres to different learning theories
 - Behaviorist Theory → *First in Math*
 - Constructivist Theory → *Squire's Environmental Detectives*
- Ipso Facto, The Matching Game
 - Best way to teach typing?



Flow + Magic Circle → Immersive Learning



Flow & Games: Admiraal, Huizenga, Akkerman, & Dam, 2011; Bressler, 2014; Bressler & Bodzin, 2013; Brom et al., 2014; Csikszentmihalyi, 1990; Hamari et al., 2016; Hou, 2015; Inal & Cagiltay, 2007; Sherry, 2004

Magic Circle & Games: Huizina, 1949; Klabbers, 2007; McGonigal, 2011; Walz & Deterding, 2015

Context Matters: Curriculum-Embedded Games

“Immersive eLearning is more than ‘fancier window dressing for content’; it is a transformation of assumptions about what it means to think, learn, and teach”

- Squire, 2008, p.15



Which curricular context?
...consider History
education,
marginalization

→ Games to the rescue?

Specifically, AR games!

Barton & Levstik, 1996; Bransford, Brown, & Cocking, 2000;
Fitchett & Heafner, 2010; Fitchett, Heafner, & Lambert, 2014;
Heafner & Fitchett, 2012; Levstik & Pappas, 1987; Pace, 2012



Curriculum for Social Studies

- The curriculum is what students experience not just what is 'taught'. (Ross, 2014)
- Intended vs Enacted



Researching Curriculum-Embedded Games (CEG)



Stand-alone learning games

- *Super Word Search* (Hong, Cheng, Hwang, Lee, & Chang, 2009)



Curriculum-Aligned GBL

- *Environmental Detectives* (Klopfer & Squire, 2008)
- *First in Math* (Flaherty, Connolly, & Lee-Bayha, 2005)



Curriculum-Embedded GBL

- After an exhaustive search....?



Game-based curriculum

- *Sick at South Beach* (Squire, 2010)

Researching Curriculum-Embedded Games (CEG)



Stand-alone learning games

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Curriculum-Embedded GBL

- After an exhaustive search....?

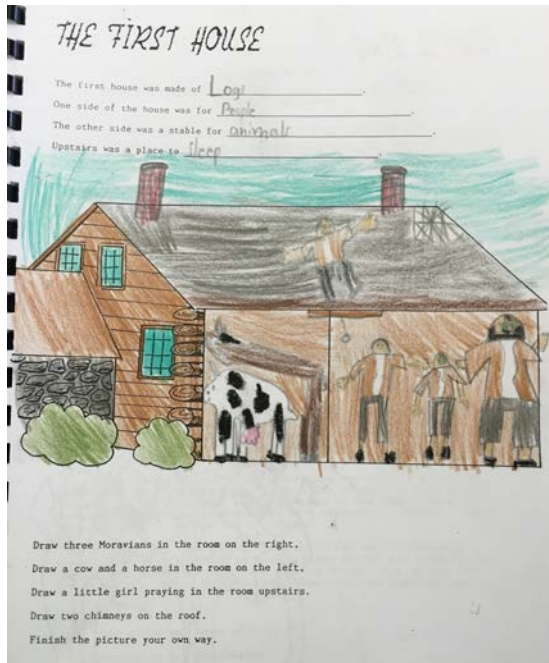


Game-based curriculum

- *Sick at South Beach* (Squire, 2010)

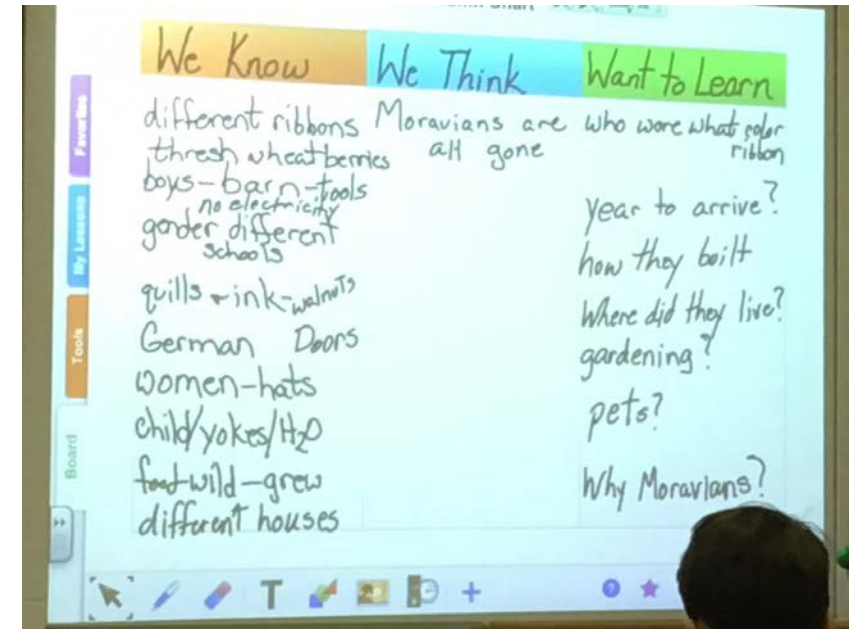
A Unique Opportunity

- Pre-existing curriculum for 2nd grade Colonial Moravian History unit
- Located in a historic district
- Teachers motivated to “try something new” in their highly traditional curriculum



Dye house

The Dye house only has 3 walls standing. The building was next to the Grist mill. The Dye house only has three walls standing because it was from the colonial Moravian times and that was a long time ago. The dyes came from natural materials.





Historical Sites



School Buildings

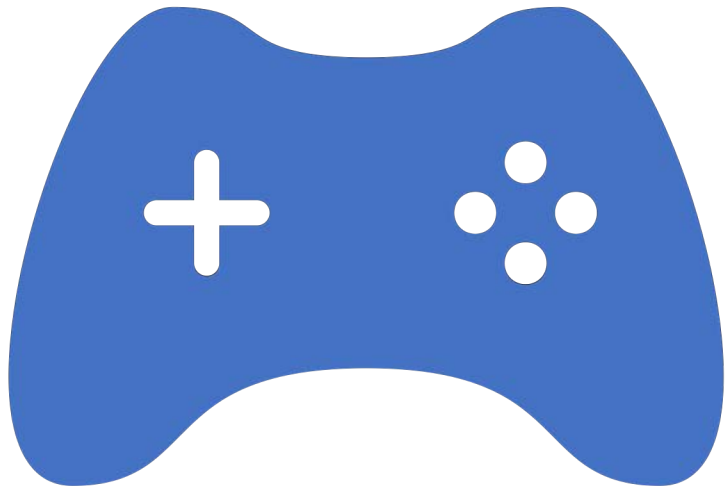


2nd Grade Building



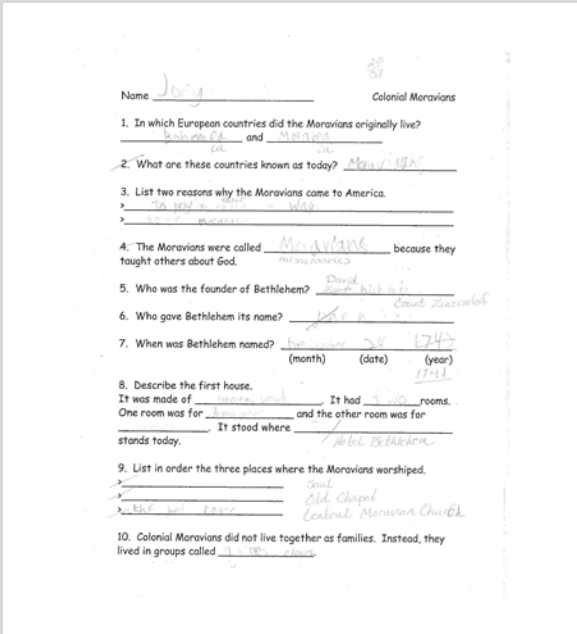
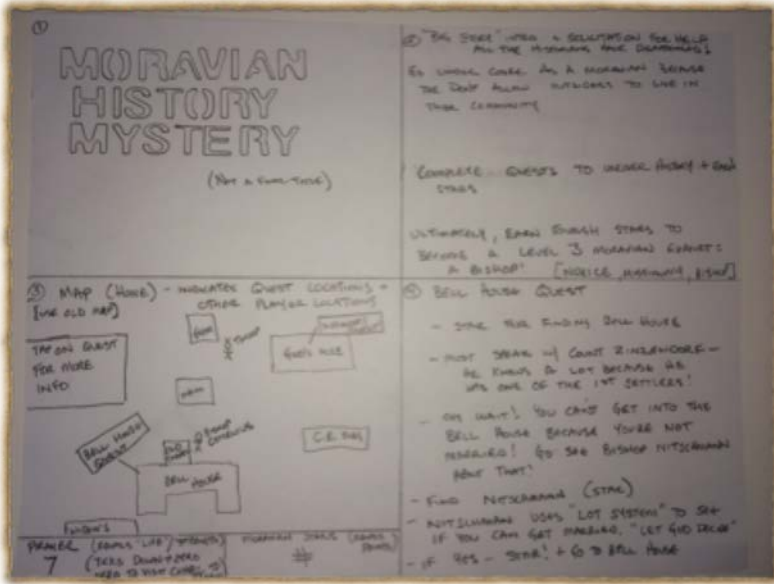
Building a curriculum- embedded game





Game (Intervention) Design

- Development started in year 0, continued in year 1 with slight modifications in year 2
- High level of collaboration with participating teachers
- Play testing, many iterations
- Half of unit test content was put into the game, half left out



Game Development

Game requirements

- "save progress" automatically so that kids don't have to remember to save and can play multiple times. Should be able to save multiple games (Team 1, Team 2).
- Use of camera by game to scan QR codes or other trigger images (like using Aurasma)
- Send broadcast messages to all players (a timed event where the time can be adjusted by the teacher or maybe triggered by an action of a single player?)
- GPS enabled map - players can see where they are in the game and maybe see where other players are too?
- Video/audio/photographs/prompts appear when player arrives at a location or makes a selection on the screen
- Track "Life/Spirit" points and "Stars" earned
- Auto-notification when you've "leveled up" - triggered by earning enough Stars

The Bell House Quest (2 stars)

- Task: Go to the Bell House and speak to Bishop ABC
- Step 1: Go to Bell House. Upon arrival:
 - Master Moravian Historian (MMH - same one from intro) awards you a Star for arriving at Bell House
 - MMH informs you that you must be married to enter house
 - If you are in a married choir, you can go right in! Proceed to Step 2
 - If you are NOT married, he sends you to go see if Bishop YYY will let you get married
 - Go to Bishop YYY's location (find on map) - choose "Can I get married?"
 - If the Lot System result is "Married" - you get a star and proceed back to the Bell House! If not, you must have your teammate try. If nobody on team can get married, must leave and come back later (timed return? GPS reset?)
- Step 2: Interact with Bishop ABC - see his image, hear/see words
 - Points that men live on one side & women on other
 - He awards you a Star!

Inspirations



SSI:

School
Scene

Investigators



Source: <http://www.wdwmagic.com/>

Prototype

Quests



Tools

Magic Window



See hidden things!

Map



Follow the map to your quest!

Quest Tracker



Track your progress!

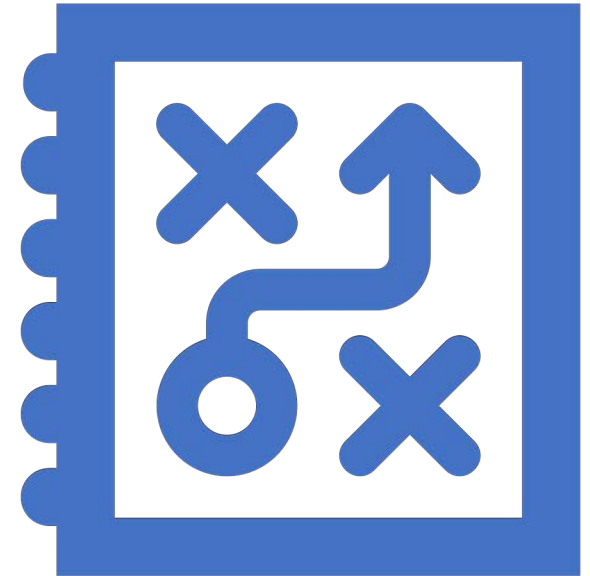


Choosing a platform



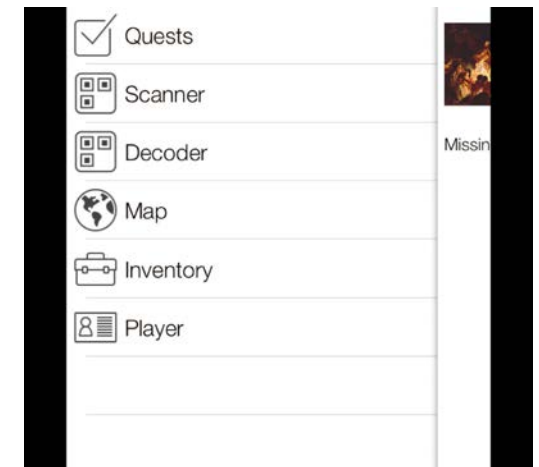
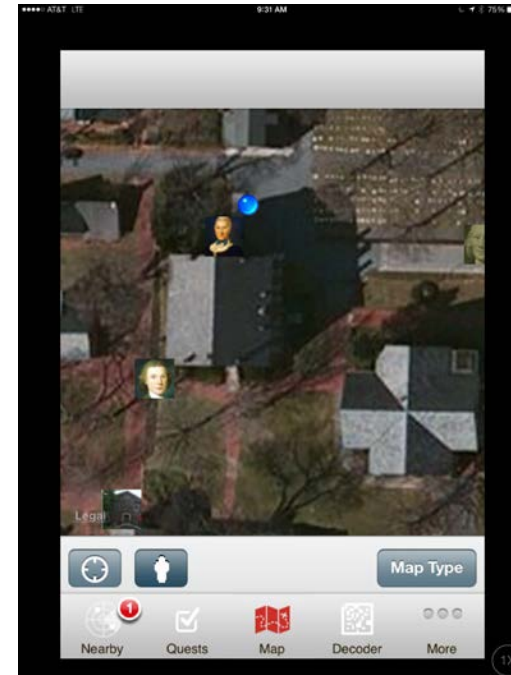
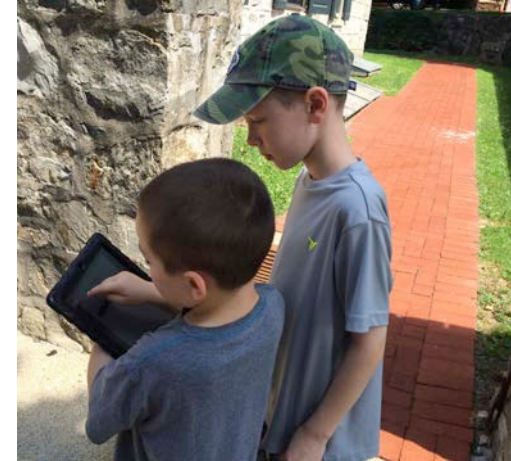
Build, test, learn, repeat

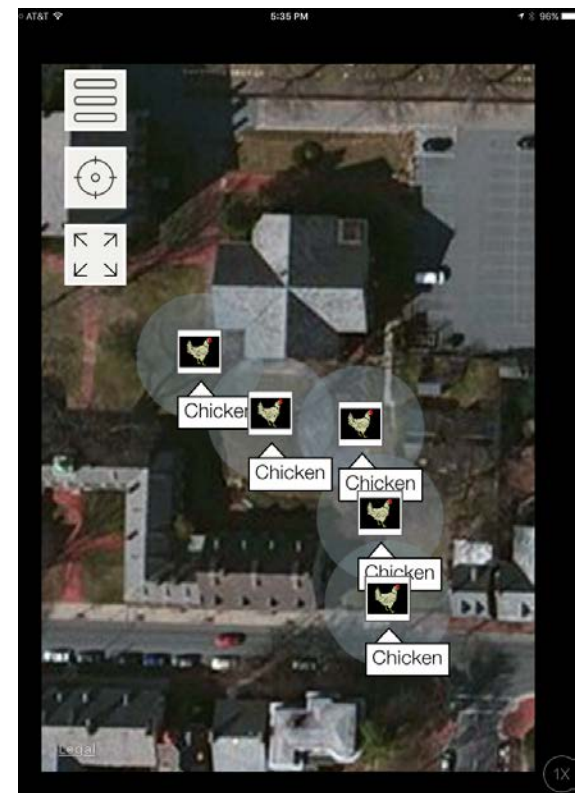
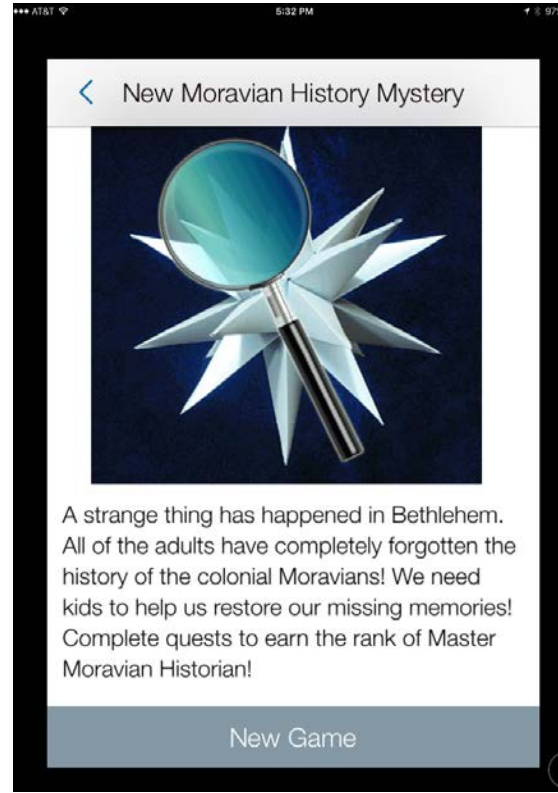
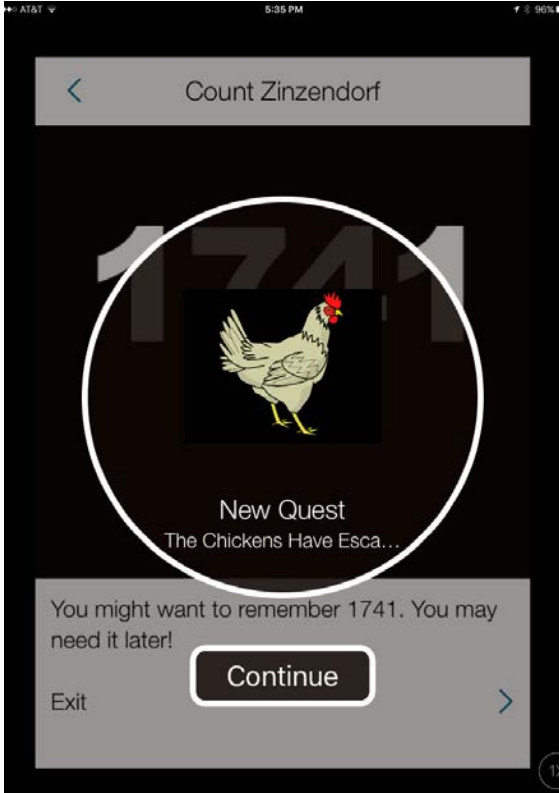
- More action, less reading
- Audio hard to hear
- Dark screen images hard to see in bright light
- GPS range needs to be robust
- Wifi-only devices don't work well
- Geospatial skills require significant scaffolding
- Reading requirements needed to be both grade level and not distracting to gameplay
- Video content was not received well in initial testing
- Certain types of gaming activities were popular and well received such as collecting items, typing codes, and figuring out the right order
- Curriculum content needs to be an active part of the game experience and not provided as "additional info"
- Teachers provided valuable insights that guided the researcher's design process



Implemented version: Moravian History Mystery

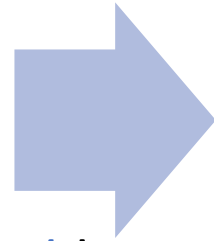
- Utilized ARIS platform
- GPS triggered AR
- Introduction in classroom
- Students played in pairs or triads





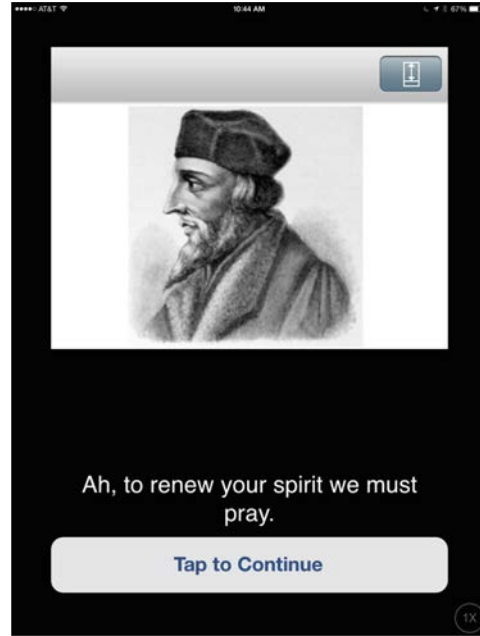
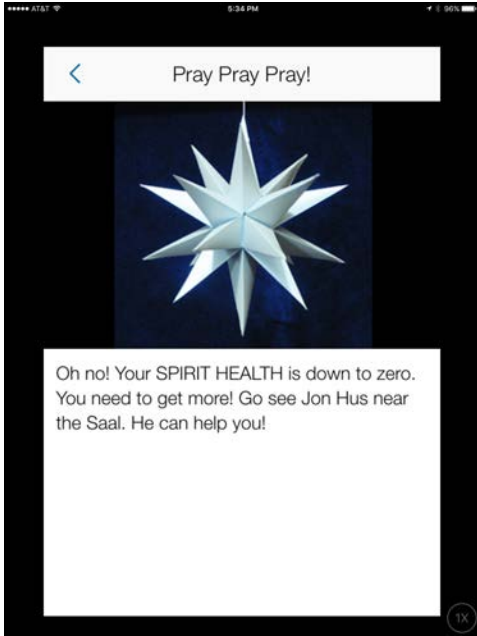
Feeling like a game...

Customs of Society



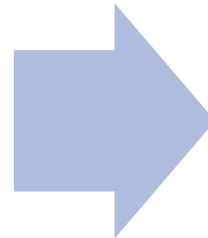
Action of Game

Sample **adaptation** of *curricular content* to *game mechanics*



Constructivist-aligned game

- Information to know
- Behaviors to emulate
- Affective hooks



Systemic Understandings & Meaning Making

The Study



Research Questions

01

In a second-grade history unit, what are student experiences playing a curriculum-embedded game?

02

In a second-grade history unit, what effect does curriculum-embedded gameplay have on...

- a. students' learning & retention of curriculum-specified content?
- b. students' learning & retention of concepts beyond those specified in the curriculum?

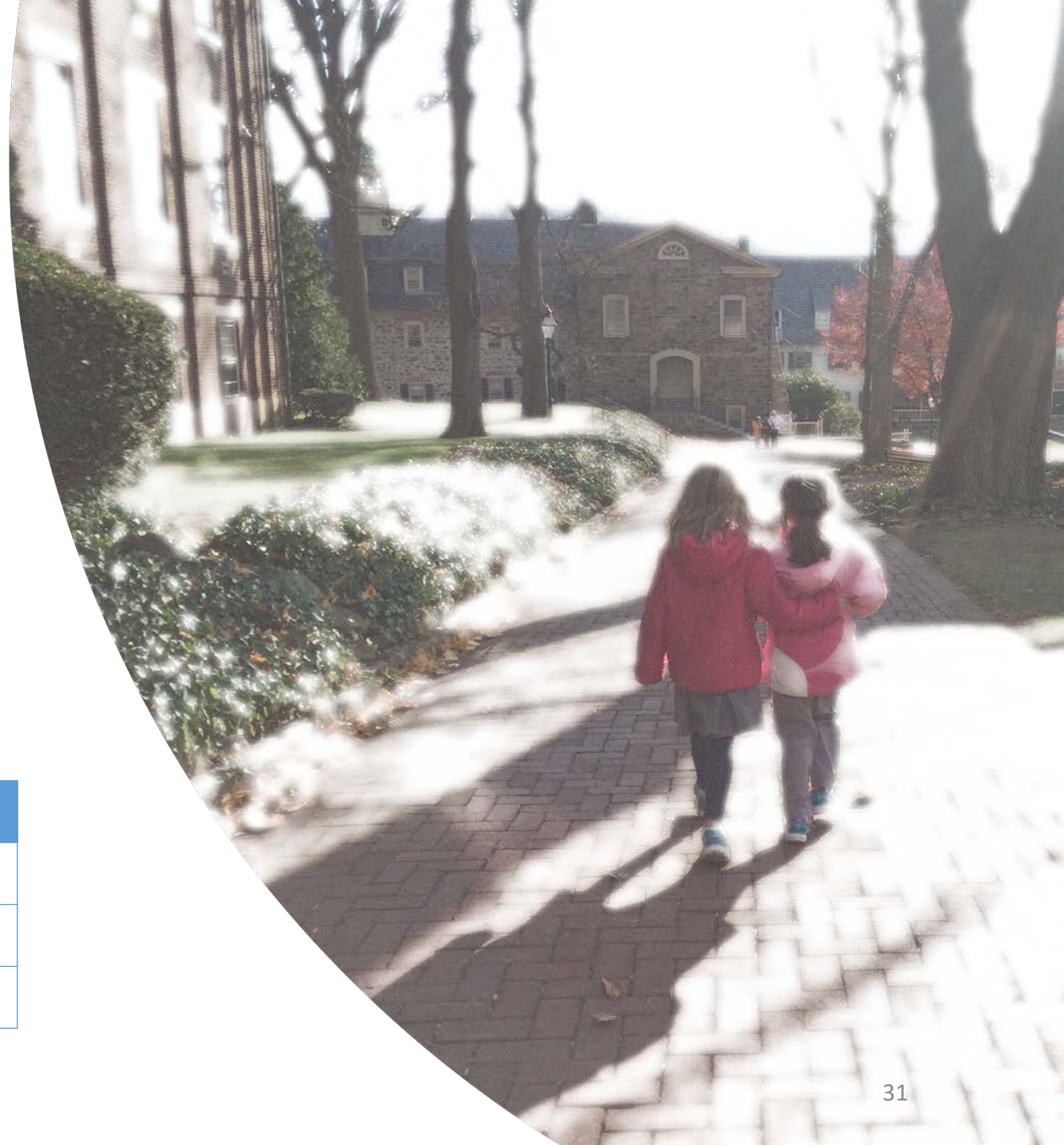
03

In a second-grade history unit, what effect does curriculum-embedded game-based learning have on instructional planning and implementation?

Setting & Participants

- Small private local elementary school
- Historic district
- Second graders, Ages 6-8
- 3 Teachers, each with 10+ years of teaching experience

	T1	T2	T3	Total
Year 1	12	13	11	36
Year 2	10		12	22
TOTAL				58





Methodology

Mixed-methods

- Implied proposition (RQ2 - learning outcomes)
- Descriptive inquiry (RQ1 & RQ3 – Student experience/Teacher experience)

Uncontrolled quasi-experiment

- No random assignment, no control group, and no lab setting
- Targeted game design to create two sub-scales on the assessment

Design-based research

- Best approach to study CEGs in an authentic environment

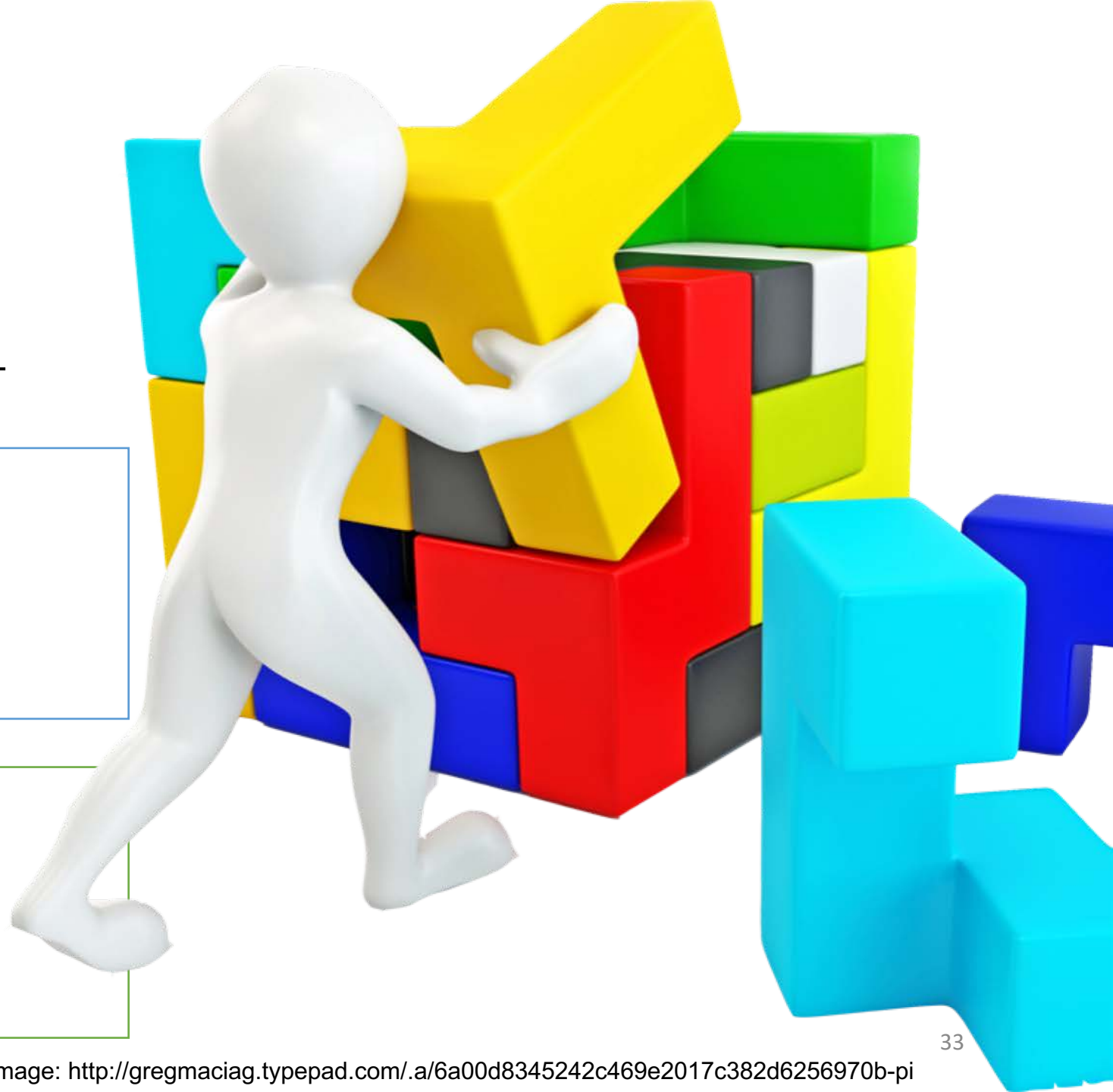
Instruments & Assessments

Quantitative

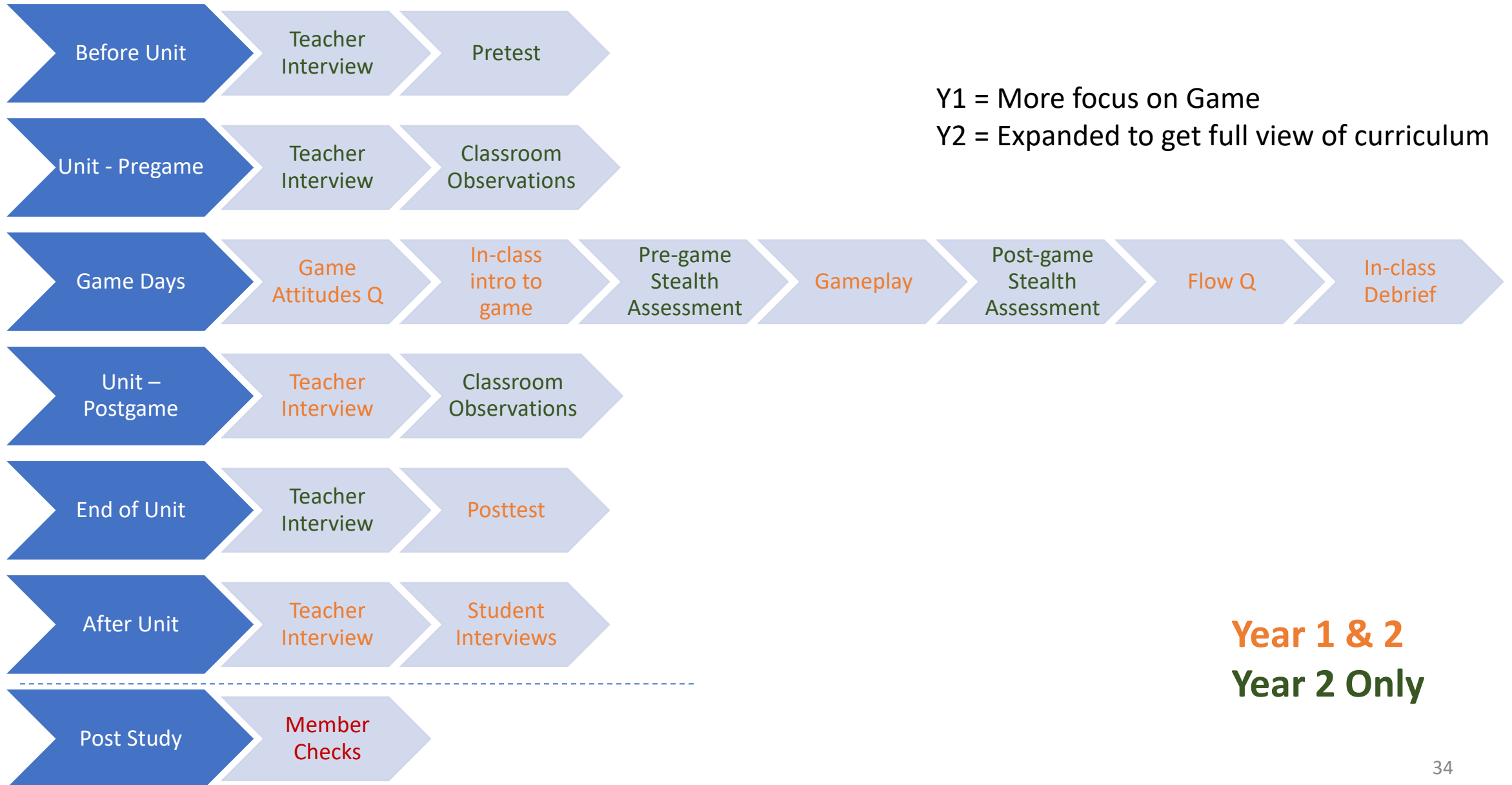
- To qualify the experience
 - Flow Questionnaire
- To observe learning outcomes
 - Unit Pretest (Y2)
 - Unit Posttest (Y1 & Y2)

Qualitative

- Student Interviews (Y1 & Y2)
- Teacher Interviews (Y1 & Y2)
- Classroom Observations (Y2)
- Classroom Debrief Sessions (Y1 & Y2)
- Stealth Pre/Post Gameplay Assessment (Y2)



Data Collection Schedule – Years 1 & 2

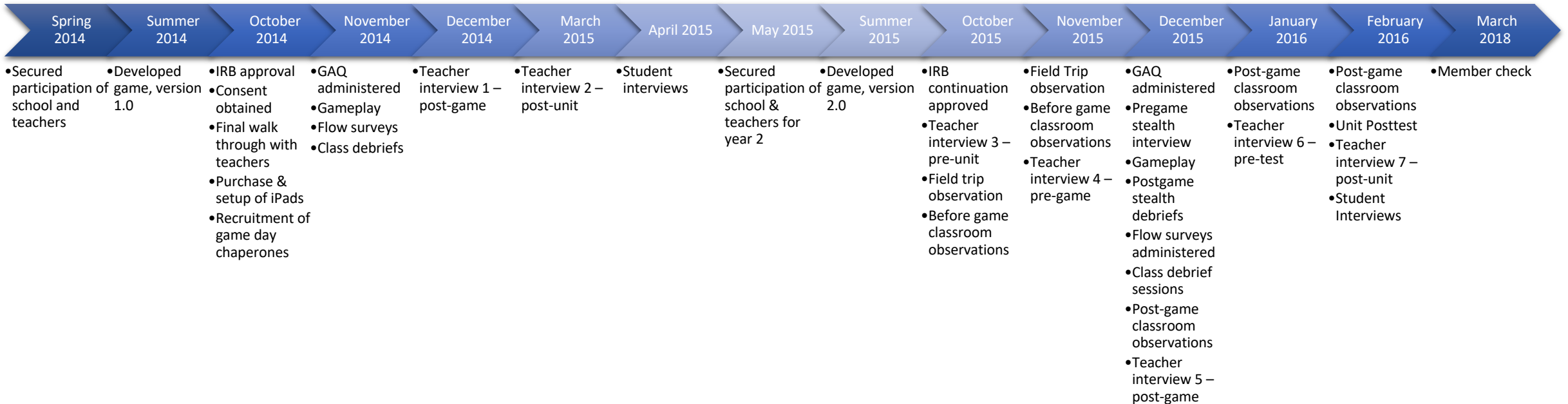


Year 1 & 2
Year 2 Only

RQs & Data Sources - Mapped to Analysis Strategy

RQ	Measures/Data Source	Analysis Procedure
2	Pre-Unit Test	Paired samples t-tests
2	Post Unit Test	
1	Flow Survey	Descriptive statistics
2 & 3	Teacher Interviews	Structured coding of game experience using flow and magic circle themes
1 & 2	Student Interviews	
1, 2, 3	Class Debrief Sessions	Structured coding of learning, using curriculum
1	Gameplay Observation Notes	Emergent coding of instructional strategies, following constant-comparative technique
2 & 3	Field Trip Observations	
1, 2, 3	Classroom Observations	
2	“Agent Interview & Debrief”	
2 & 3	Artifacts of Student Work	

Project Timeline



RQ 1 & 2 - Concurrent Triangulation

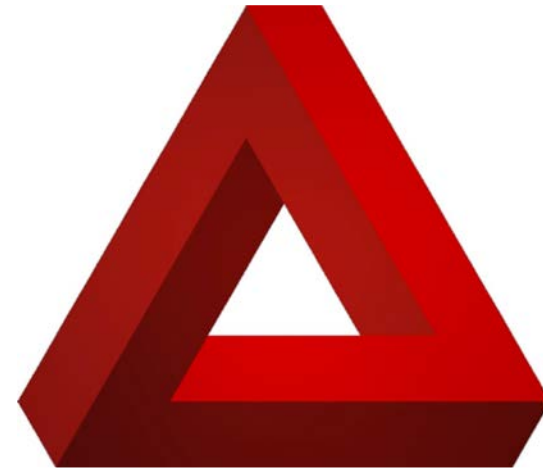
Qualitative data will be used to triangulate and contextualize quantitative findings.

Quantitative sources:

- Flow Questionnaire
- Pre & Post-unit test scores

Qualitative sources:

- Researcher observation notes
- Class debrief sessions
- Teacher interviews
- Student interviews
- “Stealth” pre/post gameplay assessment
- Artifacts of student work

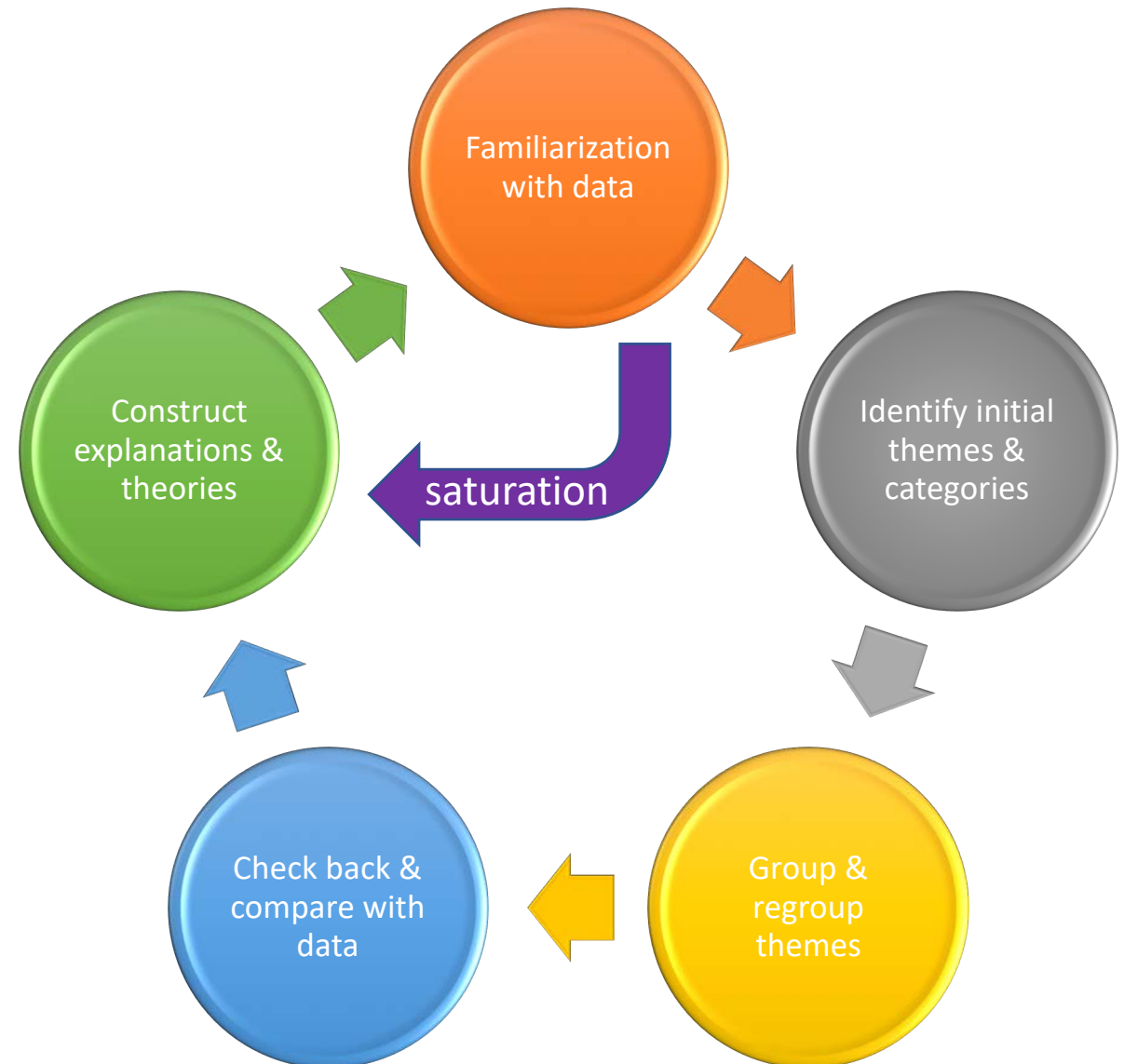


Data Analysis RQ3 – Qualitative Analysis

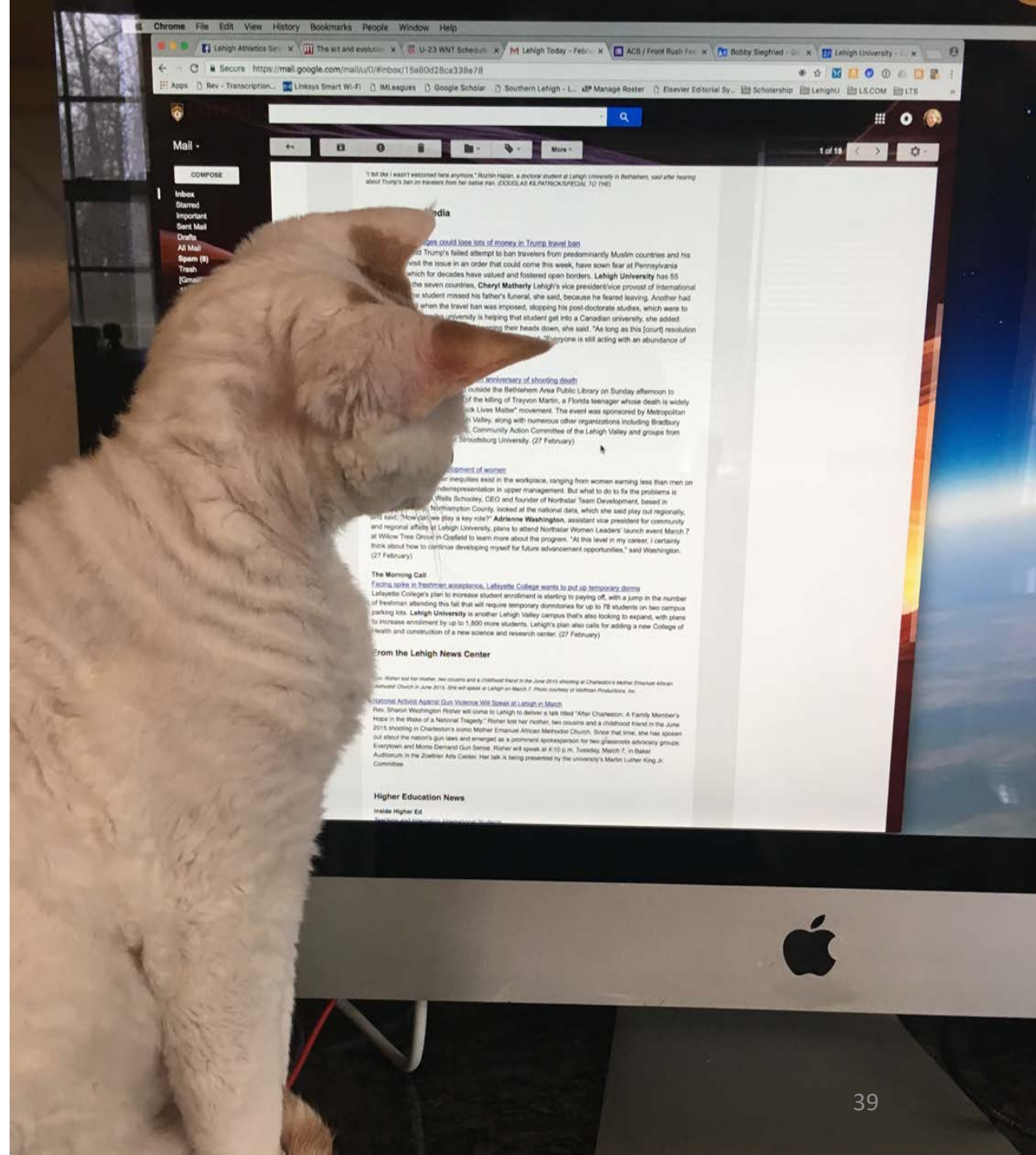
Emergent coding of qualitative **data** to identify instructional strategies and **themes**, following **constant-comparative** technique to the point of **saturation**

Qualitative sources:

- Teacher interviews
- Class debrief sessions
- Researcher observation notes
- [Student interviews]



Analysis, Results, & Findings



RQ 1

In a second-grade history unit, what are student experiences playing a curriculum-embedded game?

RQ 1 – Quantitative Analysis

Flow by Teacher			
Teacher	N	M	SD
T1	22	4.33	.46
T2	13	4.23	1.06
T3	23	4.54	.51
Total	58	4.39	.66

Flow by Class			
Class - Teacher	N	M	SD
1 – T1	13	4.36	.35
2 – T2	13	4.23	1.06
3 – T3	11	4.67	.38
4 – T1	9	4.28	.62
5 – T3	12	4.42	.59
Total	58	4.39	.66

Class 2 Flow Scores by Student			
Student ID	N	M	SD
14	1	4.00	.
15	1	4.18	.
16	1	3.91	.
17	1	1.00	.
18	1	5.00	.
19	1	4.91	.
20	1	5.00	.
21	1	4.64	.
22	1	4.27	.
23	1	4.27	.
24	1	5.00	.
25	1	4.00	.
26	1	4.82	.
Total	13	4.23	1.06

RQ 1 – Quantitative Analysis

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23	1	4.27	.
24	1	5.00	.
25	1	4.00	.
26	1	4.82	.
Total	13	4.23	1.06

RQ1 – Qualitative Analysis – Reinforced Quant

Flow and Magic Circle Qualitative Data Samples

Theme	Definition	Data
In Flow & In Magic Circle	Student statement indicates an in-flow experience and the adoption of the game's magic circle	I loved it the way it is and nothing should change about it because it was perfect. It was like best game that I ever played outside in my life. (CDT2 - S54 - 42)
		Something that really stuck in my head is that the Hotel Bethlehem used to be where her First House was and she really wanted to see it again so when we typed something...green..it it made me feel so happy that we helped her. (CDB1 - S - 51)
		I don't know...I really felt like I was not [learning], but I knew I was learning somehow because I never knew there was a person [such] as Tschoop. (SI56 - S56 - 28)
		When I get to run around, it's easier to actually learn because you don't really know that you're learning it. You just think you're playing a fun game. (SI44 - S44 - 32)
In Magic Circle	Student statement indicates adoption of the game's magic circle	I liked how we got to use the iPad, how there was a big map and we got to read the map and it would show us where widow's house, the Brethren's house, the sister's house, ect. (SI43 - S43 - 38)
		My favorite part was when we had to find the three buildings and get the keys and give them to the guy. (CDH2 - S - 16)
Not in Flow	Student statement indicates they did not experience flow	I got a little frustrated when some of the teammates wouldn't let you see the iPad or let you know what you're doing 'cause then you can't really help them if they're doing something wrong. (CDB2 - S20 - 60)
		I think because S18 was my partner it was hard because we were like splitting up and it was really hard. (CDT1 - S37 - 138)
		It was hard. (SI28 - S28 - 6)
Not in Magic Circle	Student statement indicates a rejection of the game's magic circle	The thing is, it did not really make that much sense when there's a man, who's name was John like me, and he was living on the middle of the road. Living on the middle of the sidewalk. I thought that was a little bit weird. (SI56 - S56 - 12)
		I felt that all of my teammates were getting in my space and I couldn't really focus. (CDT2 - S - 133)

Prevalence of “In Flow” and “In Magic Circle” Indicators in Student Statements

Theme	Subgroup	Number of statements
In Flow & In Magic Circle	Being active	2
	Embracing challenge	6
	Enjoyment while playing	49
	Excitement	5
	Feeling confident	2
	Feeling curious	1
	Feeling like a real game	5
	Feeling need to run	1
	Focused while playing	2
	Game feeling real	20
	Game was medium difficulty	6
	In zone	2
	Liking being outside	2
	Liking game elements	2
	Losing sense of time	2
	Liking map	2
	Wanting to play again	2

Theme	Subgroup	Number of statements
In Magic Circle	Enjoying being active	10
	Enjoying searching	3
	Enjoying playing	8
	Feeling excitement	1
	Game feeling real	5
	Importance of difficulty	1
	Liking game elements	22
	Liking partner play	2
	Liking map	12
	Sense of accomplishment	2
Wanting to play again	20	
Not In Magic Circle	Interactions with partners	1
	Map was hard	2
	Game not feeling real	1
Not In Flow	Playing difficulties	2
	Interactions with partners	10
	Challenge was hard	5

Comparing Contexts

Prevalence of “In Flow” and “In Magic Circle” Indicators in Student Statements **During Game Debriefs**

	Only Flow	In Magic Circle	Not In Magic Circle
In Flow	0	58	0
Not In Flow	8	15	1
Only Magic Circle	N/A	41	0

Prevalence of “In Flow” and “In Magic Circle” Indicators in Student Statements **During Interviews**

	Only Flow statements (students)	In Magic Circle statements (students)	Not In Magic Circle statements (students)
In Flow	0	60 (17/18)	0
Not In Flow	9 (5/18)	7 (6/18)	3 (2/18)
Only Magic Circle	N/A	44 (17/18)	0

RQ1 – Finding 1:

Students experienced the game as a “real game”, finding it enjoyable, immersive, and worthy of play.

Quantitative Results

- Average Flow score was 4.39 (out of 5)

Qualitative Evidence

- “I loved it the way it is and nothing should change about it because it was perfect. It was like best game that I ever played outside in my life.” (CDT2 - S54 - 42)
- “When I get to run around, it's easier to actually learn because you don't really know that you're learning it. You just think you're playing a fun game.” (SI44 - S44 - 32)
- I got a little frustrated when some of the teammates wouldn't let you see the iPad or let you know what you're doing 'cause then you can't really help them if they're doing something wrong. (CDB2 - S20 - 60)

RQ 2

In a second-grade history unit, what effect does curriculum-embedded gameplay have on...

- a. students' **learning & retention** of *curriculum-specified* content?
- b. students' learning & retention of concepts *beyond* those specified in the curriculum?

RQ2A - Quantitative Analysis

CEG and students' learning & retention of curriculum-specified content?

Limitations of Assessments

- Pre and Posttests were not identical
- Posttest generated a ceiling effect



Analysis Strategies

- Compare only matched questions
- Compare scores below the mean

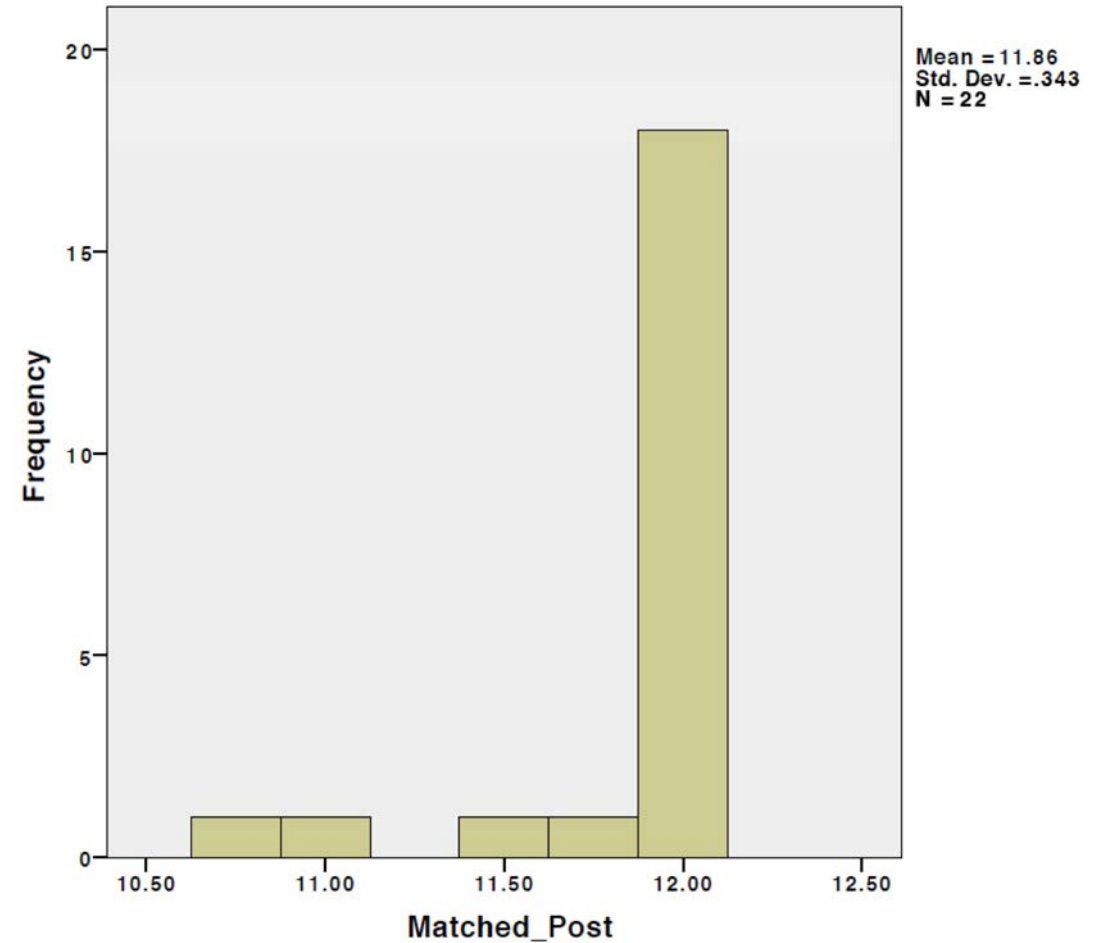
Matched Pretest and Posttest Questions

Game Related?	Pretest Question	Posttest Question
non-game	From what 2 countries did the Moravians come?	In which countries did the Moravians originally live?
game	Who gave Bethlehem its name?	Who gave Bethlehem its name?
game	When was Bethlehem named?	When was Bethlehem named?
non-game	Where did the single men live?	Where did the single brothers live?
non-game	Where did the widows live?	Where did the widows live?
game	Where did the single women live?	Where did the single sisters live?
game	Where did the married couples live?	Where did the married couples live?
game	The Moravians divided themselves into groups called....?	Colonial Moravians did not live together as families. Instead, they lived in groups called [fill in blank].
game	The Moravian cemetery is called?	[fill in blank] is the Moravian cemetery.
non-game	This is celebrated 4 weeks before Christmas	The 4 weeks before Christmas are called the season of [fill in blank]
non-game	This is the scene that tells the Christmas story	The Moravians decorate their homes and churches with a [putz] to tell the story of Christmas.
non-game	The church service in which the Moravians share buns and coffee together is called a?	The song service in which food such as cookies and juice are served is called a [fill in blank].

Matched Posttest – Ceiling Effect

18/22 had perfect scores!

Descriptive Statistics for all Matched Posttest Cases					
	N	Min	Max	M	SD
Matched Post	58	3.50	12.00	10.85	2.04



Paired Samples T-Test #1 – Whole sample (Y1 & Y2)

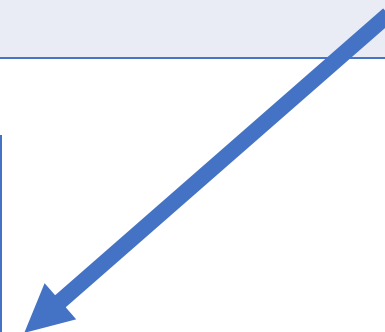
Is there a difference between matched posttest game-related scores and matched posttest non-game-related scores?

Descriptive Statistics for Matched Posttest Cases below the Mean					
	N	Min	Max	M	SD
Matched Game Related	58	2.50	6.00	5.54	.82
Matched Non-Game Related	58	1.00	6.00	5.31	1.35

Paired Samples Test Comparing Game and Non-Game Matched Posttest Scores									
		95% Confidence Interval of the Difference							
		M	SD	SE of M	Lower	Upper	t	df	Sig (2-tailed)
Pair 1	Matched Posttest Game-Related Matched Posttest Non-Game-Related	.23	.92	.12	-.01	.47	1.93	57	.058

Assumptions violated as the items were correlated.

Paired Samples Correlations				
		N	Correlation	Sig.
Pair 1	Matched Game Related Matched Non-Game Related	58	.75	.000



Paired Samples T-Test #1 – Sub-Sample (Y1 & Y2)

Is there a difference between matched posttest game-related scores and matched posttest non-game-related scores for the 15 students that scored below the posttest mean of 10.58?

Descriptive Statistics for Matched Posttest Cases below the Mean

	N	Min	Max	M	SD
Matched Game Related	15	2.50	6.00	4.38	.84
Matched Non-Game Related	15	1.00	6.00	3.53	1.64

Paired Samples Test Comparing Game and Non-Game Matched Posttest Scores

		95% Confidence Interval of the Difference							
		M	SD	SE of M	Lower	Upper	t	df	Sig (2-tailed)
Pair 1	Matched Posttest Game-Related								
	Matched Posttest Non-Game-Related	.85	1.60	.41	-.03	1.73	2.06	14	.058

No statistical difference between game-related and non-game related scores for students who scored below the mean suggesting there was no game-effect on the posttest scores.

Remember the limitations of this test though.....ceiling effect....low sample size...not many items....

Paired Samples T-Test #2 & #3

– Whole Sample (Y2)

#2 - Is there a difference between matched *pretest non-game* scores and matched *posttest non-game* scores?

#3 – Is there a difference between matched *pretest game* scores to matched *posttest game* scores?

Descriptive Statistics for Selected Pre and Posttest Matched Items					
	N	Min	Max	M	SD
Matched Pretest (12 items)	22	.00	11.00	5.30	2.82
Matched Pretest Game (6 items)	22	.00	6.00	3.00	1.57
Matched Pretest Non-Game (6 items)	22	.00	5.50	2.30	1.49
Matched Posttest (12 items)	22	10.75	12.00	11.86	0.34
Matched Posttest Game (6 items)	22	5.50	6.00	5.91	0.24
Matched Posttest Non-Game (6 items)	22	5.00	6.00	5.95	0.21

Paired Samples Test for Matched Pre and Posttest Game and Non-Game Items

		95% Confidence Interval of the Difference							
		M	SD	SE of M	Lower	Upper	t	df	Sig (2-tailed)
Pair 1	Matched Pretest Game Matched Posttest Game	-2.91	1.61	.34	-3.62	-2.20	-8.46	21	.000
Pair 2	Matched Pretest Non-Game Matched Posttest Non-Game	-3.66	1.48	.31	-4.31	-3.01	-11.64	21	.000

Significant statistical difference between pre and post for both game and non-game items. NOT surprising. Students typically DO do better on posttests than pretests!

Paired Samples T-Test #2 & #3 (Y2)

#2 - Is there a difference between matched *pretest non-game* scores and matched *posttest non-game* scores?

#3 – Is there a difference between matched *pretest game* scores to matched *posttest game* scores?

...for the 13 students who scored below the 5.30 pretest mean

Descriptive Statistics for Selected Pre and Posttest Matched Items					
	N	Min	Max	M	SD
Matched Pretest (12 items)	13	.00	5.00	3.50	1.54
Matched Pretest Game (6 items)	13	.00	3.00	2.08	0.95
Matched Pretest Non-Game (6 items)	13	.00	3.00	1.42	0.93
Matched Posttest (12 items)	13	10.75	12.00	11.85	0.36
Matched Posttest Game (6 items)	13	5.50	6.00	5.92	0.16
Matched Posttest Non-Game (6 items)	13	5.00	6.00	5.92	0.28

Paired Samples Test for Matched Pre and Posttest Game and Non-Game Items

		95% Confidence Interval of the Difference							
		M	SD	SE of M	Lower	Upper	t	df	Sig (2-tailed)
Pair 1	Matched Pretest Game Matched Posttest Game	-3.85	1.02	.28	-4.46	-3.23	-13.55	12	.000
Pair 2	Matched Pretest Non-Game Matched Posttest Non-Game	-4.50	.98	.27	-5.09	-3.91	-16.57	12	.000

Significant statistical difference between pre and post for both game and non-game items. NOT surprising. Students typically DO do better on posttests than pretests!

Paired Samples T-Test #4 – Whole Sample (Y2)

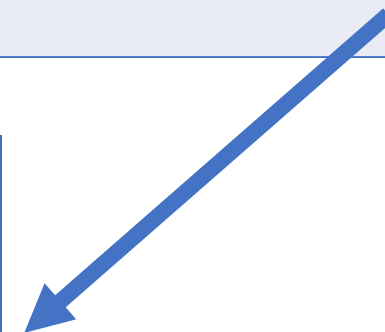
An additional paired samples t-test was run to determine whether pre to posttest score improvements could be attributed to game-effect by comparing mean differences.

Statistics for Game & Non-Game Differences between Pre & Posttest				
		N	M	SD
Pair 1	Matched Non-Game Difference	22	3.66	1.48
	Matched Game Difference	22	2.91	1.61

Paired Samples for Matched Game and Non-Game Differences between Pre and Posttest								
95% Confidence Interval of the Difference								
	M	SD	SE of M	Lower	Upper	t	df	Sig (2-tailed)
Matched Non-Game Diff	.75	1.28	..27	.18	1.32	2.75	21	.012
Matched Game Diff								

Assumptions violated as the items were correlated.

Paired Samples Correlations				
		N	Correlation	Sig.
Pair 1	Matched Game Related	22	.66	.001
	Matched Non-Game Related			



Paired Samples T-Test #4 (Y2)

An additional paired samples t-test was run to determine whether pre to posttest score improvements could be attributed to game-effect by comparing mean differences.

Statistics for Game & Non-Game Differences between Pre & Posttest				
		N	M	SD
Pair 1	Matched Non-Game Difference	13	4.50	.98
	Matched Game Difference	13	3.85	1.02

Paired Samples for Matched Game and Non-Game Differences between Pre and Posttest								
95% Confidence Interval of the Difference								
	M	SD	SE of M	Lower	Upper	t	df	Sig (2-tailed)
Matched Non-Game Diff	.65	1.15	.32	-.04	1.35	2.05	12	.062
Matched Game Diff								

No statistical difference no statistically significant difference between mean differences of game and non-game related items.

Remember the limitations of these test though.....ceiling effect....low sample size...not many items....

RQ2A – Finding 2:

Inconclusive indicators of a game vs non-game-related effect on curriculum-specified learning

Quantitative Results

- Inconclusive – can't point to a game effect.

RQ2B - Qualitative Analysis

CEG and students' learning & retention of concepts beyond those specified in the curriculum?

4 Qualitative Data Sets

- Student interviews
- Class debrief sessions
- Stealth pre and post-game assessments
- Classroom observations

2 Types of Groupings

- Levels of Learning
- Proximity to Gameplay: Before, close, medium, far

Categorizing Levels of Learning

1

“Mastery” Content

- content that either is on the posttest or could be on the posttest. It is information that the teachers plan to present during instruction and expect the students to fully understand and remember.

2

“Exposure” Content

- content that is part of the intended curriculum but that students are not necessarily expected to remember and would never be on the test.

3

“Beyond” Content

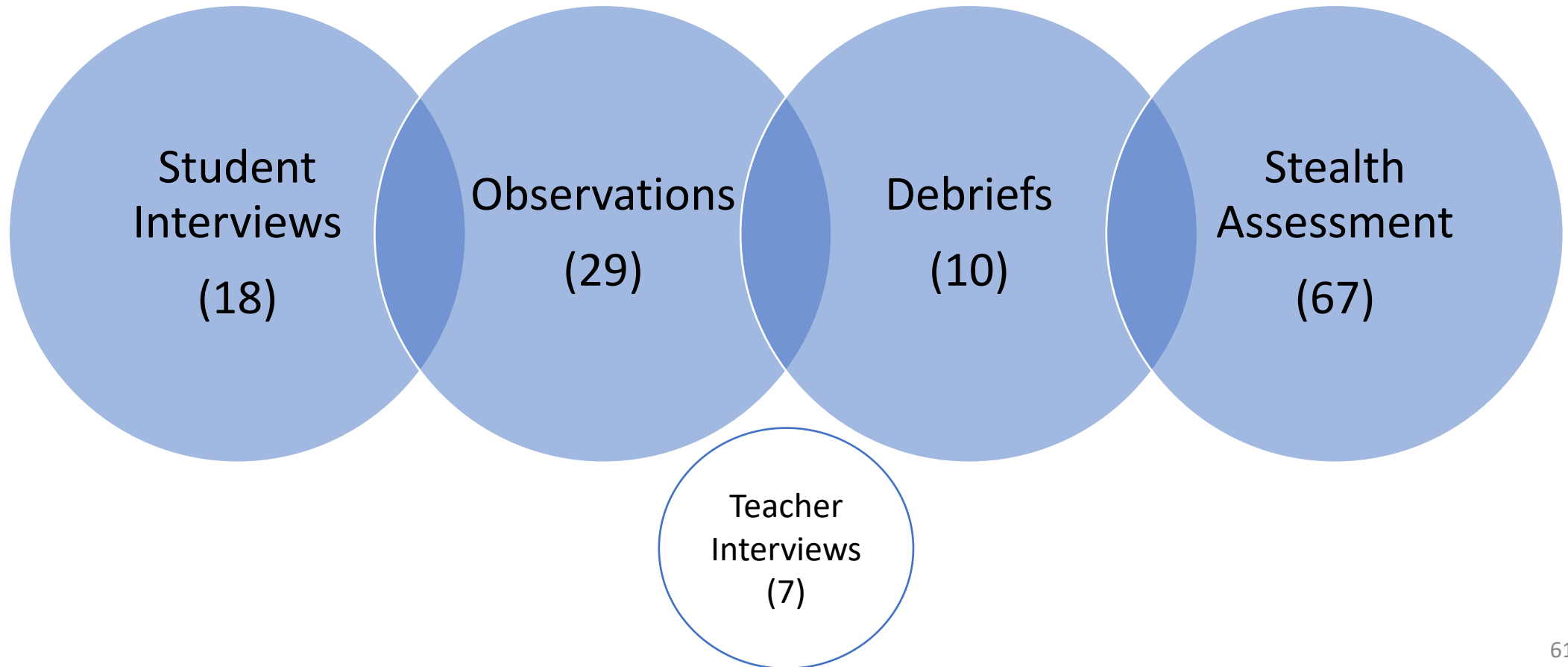
- content that exceeds the intended curriculum but that is connected to the unit. It is learning that the teacher never intended to occur and is not a planned part of instruction

Note: These categories were confirmed with member-checks.

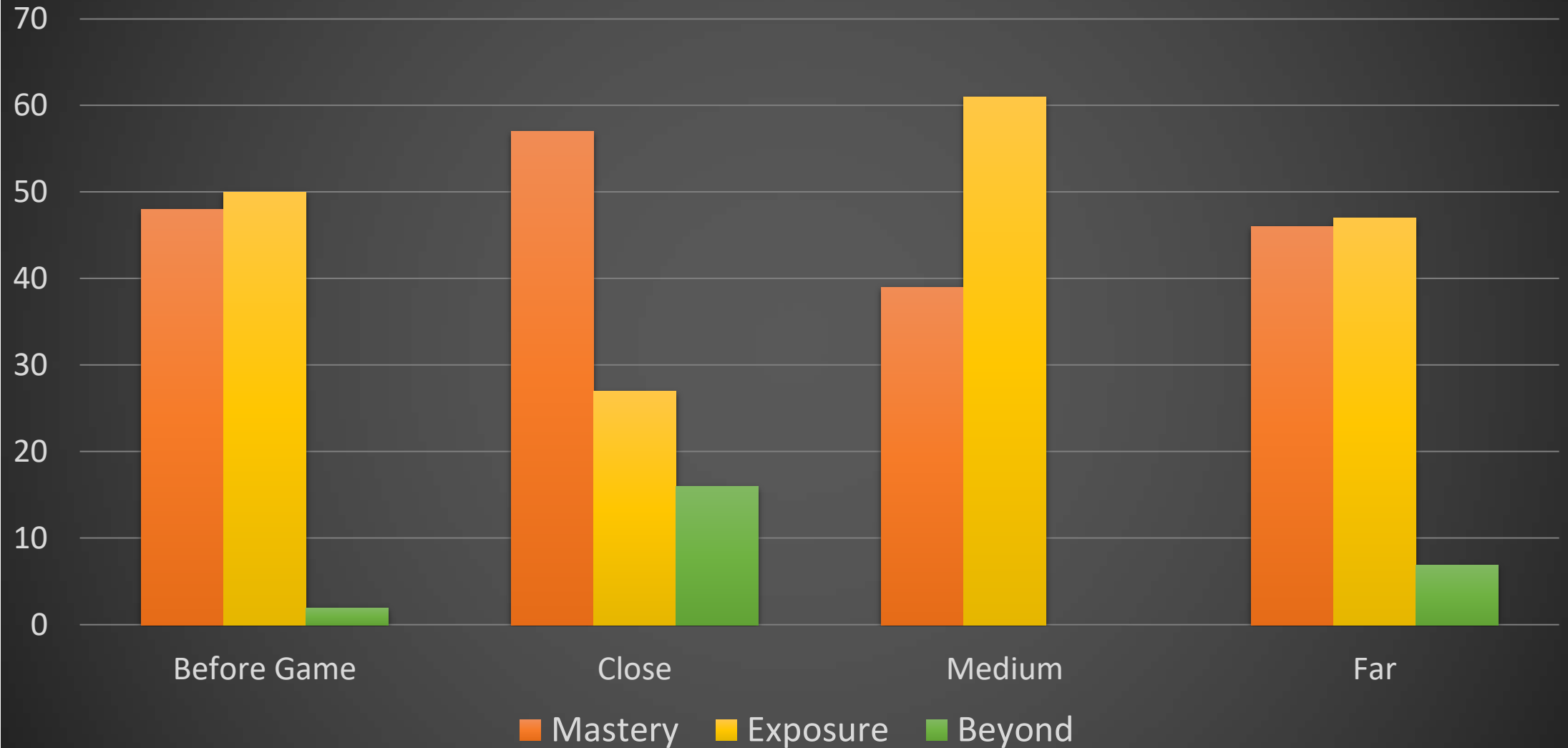
Learning	Proximity	Statement	Rationale
Mastery	Before	They had different houses for different people. (OB1H - S - 38)	Statement directly point to a posttest question: Q10 - Colonial Moravians did not live together as families. Instead, they lived in groups called [blank]
	Close	Saal, Old Chapel, and the Central Moravian Church (BCD2 - S25 - 122, 124)	Q9 - List in order the 3 places where the Moravians worshiped.
	Medium	[asked to define Missionary] Someone doing religious work (OB9H - S - 42)	Q4 - The Moravians were called [Missionaries] because they taught others about God.
	Far	I remember when it said, "Who found Bethlehem?" And I remember it's David Nitchman. (SI57 - S57 - 88)	Q5 Who was the founder of Bethlehem?
Exposure	Before	[Zinzendorf] paid for ships so they could go to Africa, north america, and Greenland. (OB2H - S - 86)	Zinzendorf is an important name, but this is a detail students would not be expected to recall.
	Close	I liked when I found Tschoop and found out that his real like his Moravian name was John. (BCD1 - S18 - 39)	Tschoop is part of the curriculum but students wouldn't be expected to recall his Christian name.
	Medium	Asked why Moravians learned German] Because when everyone was done at being a...person that teaches about God...missionary! They have to go back and they don't want to forget their language. (OB13T - S - 43)	Moravians' work as missionaries is part of the curriculum but students wouldn't be expected to recall why the Moravians learned German.
	Far	We got to see the Nain house and I didn't know about the Nain house before. (SI43 - S43 - 62)	The Nain House is mentioned in the curriculum but it is not a major landmark and is not on the list of buildings students are expected to recall.
Beyond	Before	They didn't have electricity. They used yokes to get water.They had longer school time than we do now. They did not invent SMART boards. They did not have iPads. They did not have water fountains. (PRG1 - TH1 - 1)	This is a detailed comparison of how colonial Moravian life is different than modern life using student-generated examples and not ones provided by the curriculum.
	Close	I learned that Martha Washington prayed in the Old Chapel...George Washington's wife I think. And so did John Quincy Adams and his father, John Adams. (TCD1 - S31 - 115)	These historical figures were not part of the intended curriculum but the information was available to students during game play.
	Medium	[No examples recorded]	[No examples recorded]
	Far	I liked how we got to use the iPad, how there was a big map and we got to read the map and it would show us where widow's house, the Brethren's house, the sister's house, ect. (SI43 - S43 - 38)	Reading and understanding how to use a GPS map was not part of the intended curriculum but was a necessary part of gameplay.

Qualitative Analysis

- Qualitative data is not comprehensive
 - Students may not be called on
 - Not all students were interviewed
 - Researcher did not observe/record every moment



Gameplay Proximity & Types of Learning – Percent of Statements



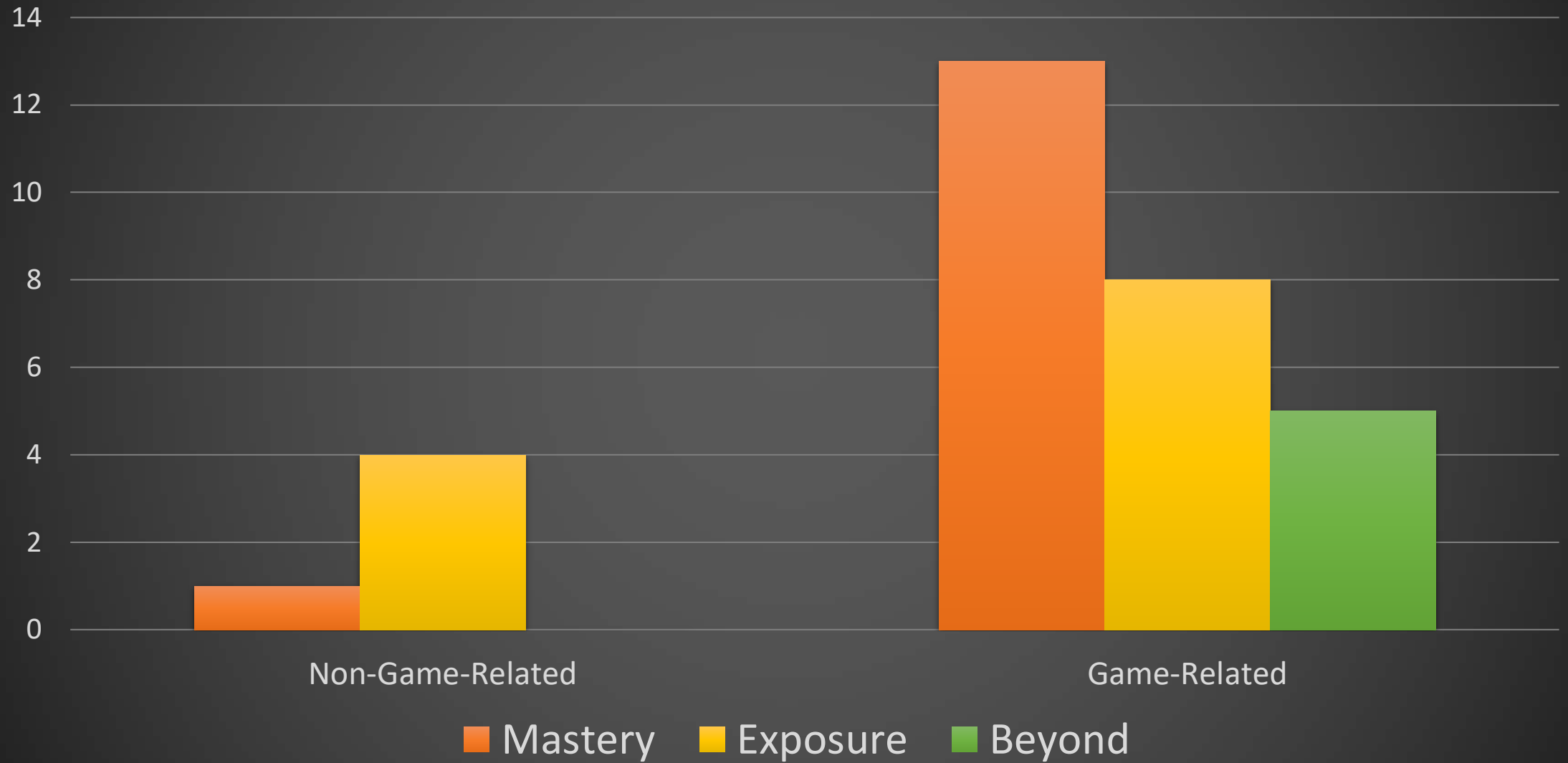
Before: Observations of regular instruction prior to gameplay, stealth pregame

Close: Postgame debriefs, stealth postgame

Medium: Observations of regular instruction after gameplay

Far: Student interviews

of Students Demonstrating Learning During Individual Interviews



RQ2B – Finding 3:

There may be a game effect leading to greater learning “beyond the curriculum” and greater retention for some students

Evidence

- More than half (234/453) of post-game statements were game-related
- During interviews, students more often recalled game-related content than non-game related content in all three levels of mastery
- The closer to gameplay, the more “beyond” statements
- “Exposure” learning grew post gameplay
- “Beyond” learning persisted after unit

Teacher interviews supported finding #3

And they remember what a missionary is, where kids in the past, they would get pilgrims and Moravians mixed up and these kids don't. [T3] And we even had... One time I even had a guest from a Moravian church come in who has been to Nepal and so on, so trying to tie it in with... [55] ...with present day missionaries, and it didn't hit them the same way the game has.

(T16 - T1 & T3 - 52)

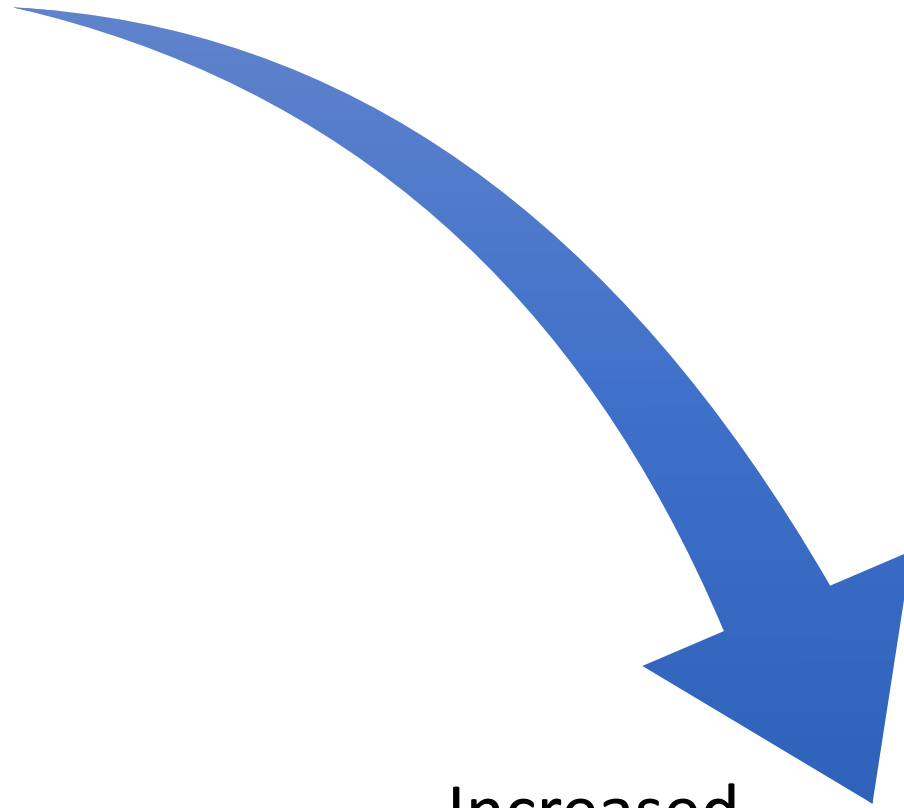
I really do think the game contributed to [better test scores] because even some of my, I know I probably shouldn't say this, but weaker test takers did really well on this test. Kids that I may not have expected to do as well, I think did better, and I think part of it was their excitement about the unit.

(T12 - T2 - 35)

RQ2B – Finding 4:

Students' learning from non-didactic instruction, specifically curriculum-embedded games, may extend beyond just learning and content acquisition and may increase students' level of enthusiasm and sense of ownership of historical content.

Non-didactic experiences



Increased

- ownership of knowledge
- enthusiasm for historical content

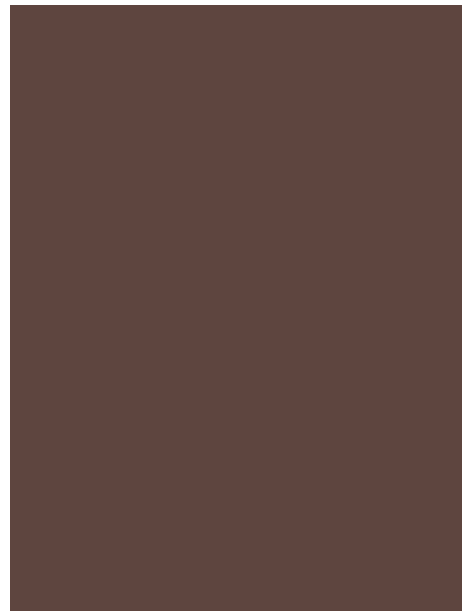
Ownership

“No, it was the first house and THEN it was the Hotel Bethlehem,” (CDT1 - S - 11).

“I think, that's a little bit empowering for them because they're like hey, we already know about this. Whereas before, they didn't know anything until we told them,”
(T11 - T2 - 33)

Enthusiasm

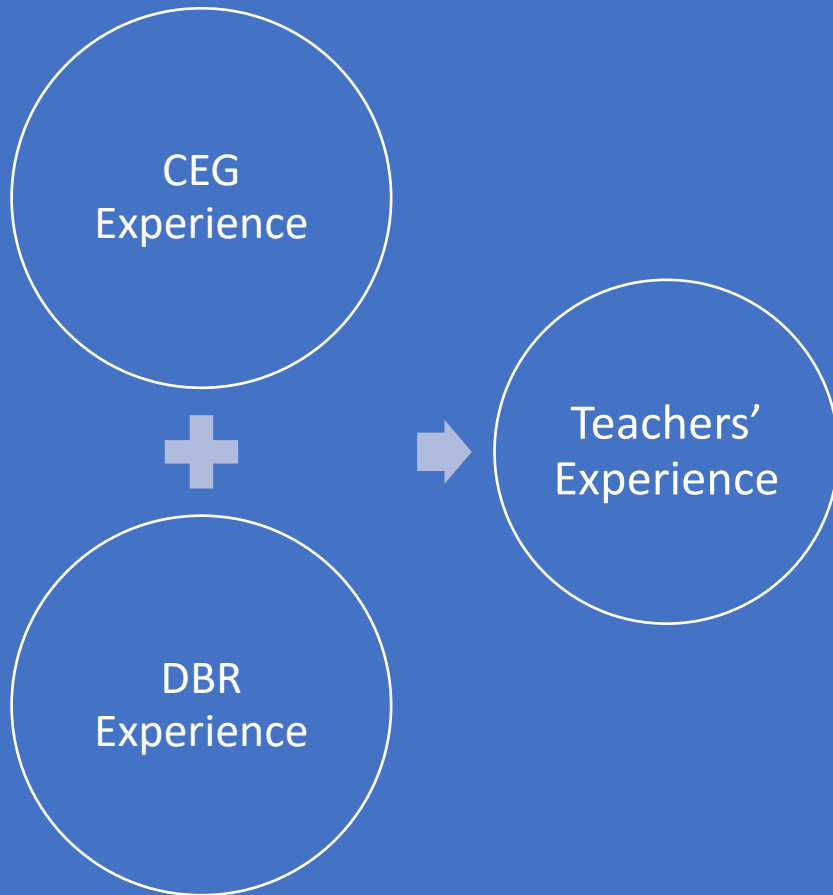
- When we went to the Gemeinhaus House, we went to the music room...and it had that Dr. Seuss horn!" (OB6H - S - 5)
- ...about how much they enjoyed the unit and about how much they taught, the children taught their parents about the history because how much they remembered, even down to the dates and the details, and I think that you, the fact that you used so many specific examples from the book, like the seal, when we got to that page in the book they were like, "oh we remember that and the lamb!" and so they were referencing the game. (T12 - T2 - 53)



RQ3

In a second-grade history unit, what effect does curriculum-embedded game-based learning have on instructional planning and implementation?

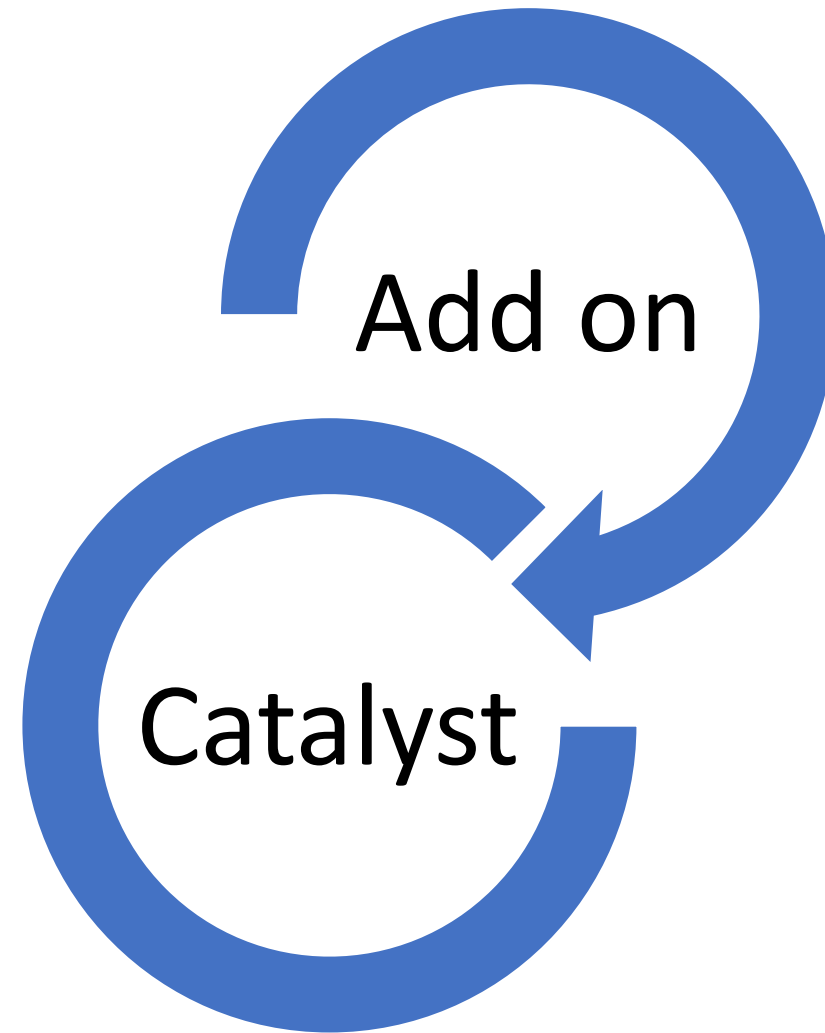
A Caveat...



- I think I thought about you coming in...It really made me analyze the way lessons were presented. It did. The one activity you said, 'Did you do this last year?' I did not. I would have offered more teacher guidance to the kids whereas I'm thinking ... I think this again is how you set the tone in a child's discovery of something. Instead of me just guiding them in the lesson on the smart board, it was more hands on with the game. I think you influenced the way I presented the material. (T17 - T3 - 23)
- "I didn't see you that way. I just saw you as a person who was interested in the way children learn, and that made me look at the way things are taught a little bit more carefully," (T17 - T3 - 37).
- "You (the researcher) just became part of the lesson," (T17 - T1 - 43)

RQ3 – Finding 5

Over the course of two years, teachers' perception of the instructional role of the curriculum-embedded game evolved from being an 'add-on' to being a catalyst.



Evidence for Finding #5

Add-on

- “I was excited about you know, beefing up our program, bringing it more into the 21st century sort of thing,” (T12 - T1 - 70).

Catalyst

- “We were able to say, ‘Do you remember this? Do you remember seeing the seal when we were out?’ And so, we could bring the game back in,” (T12 - T3 -37).
- “Well, I felt like I knew the game better this year. I felt more successful [than] when we first played it...I think I went into the study with a better understanding of what you were expecting from the game for the kids to learn. Thus, I could bring it into the classroom, then, and make sure some points were made in the teaching, or guide the kids toward making some observation through the game. So, I think my teaching was different this year just because of my understanding of the game. “ (T16 - T1 - 91)

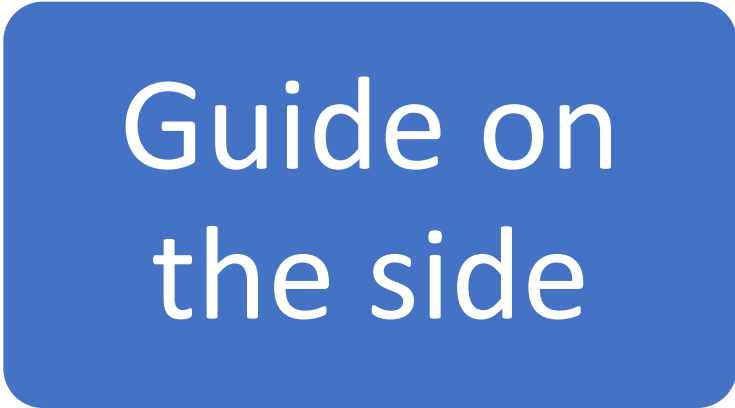
RQ3 - Finding 6

Enacting a curriculum that included an embedded game encouraged the transformation of the teacher from direct instructor to that of learning facilitator.

Sage on
the stage



Guide on
the side



Evidence for Finding #6

“Getting outside and walking around and going to those buildings for a purpose...helped. Yes, and not just walking there and reading the historic label or just reading about it in a book. [The game] brought it more to life,” (T17 - T3 - 251).

“What do you think about using this as the beginning of a lesson and then our part is more of the enrichment type? We'll just kind of flip-flop things. What do you think?” (T13 - T3 - 149).

Finding #6 – shift within context

Shift from sage to guide aligned well with the school's heritage and culture

“The Moravians [who founded the school], Comenius, his thought was to learn through play. I think that's always in the back of our minds,” (T13 - T1 - 72)

CEG experience may have acted as a catalyst for this shift:

“Over the summer we read the Creating Innovators book and then some of us read some additional books along the same line about how to work with students today and have them think outside the box. Look at a different way that we can present material. Your activity with the kids was just foremost in my brain as I'm reading this because that is exactly the sort of thing that I think the book was trying to have teachers think about doing. As opposed to just the way it has always been done, for the last 100 years.” (T13 - T3 - 41)



Finding #7

Experiencing a curriculum-embedded game influenced teachers' attitudes regarding game-based learning and impacted instructional decision-making.

Evidence for Finding #7

Opinion of GBL

- It's changed my overall opinion towards gaming some because I feel that children have lost a lot of fine motor skills...because of all of the gaming and electronic things they've been doing over the years. But I have seen, there's validity to using it also, so it's brought my opinion up. (T12 - T1 - 109).
- I think it brings in kids who...we have all these modalities, and children learn a different way. It just kind of pulls it all in. No matter what kind of learner you are, visual or auditory or kinetic, it's just all there when you're doing the game. It also brought out kids who were a little bit more subdued in the classroom, and I love seeing that. One of the quietest children in the classroom was having the best time ripping around and running with her iPad. (T17 - T3 - 244)

Instructional Decisions

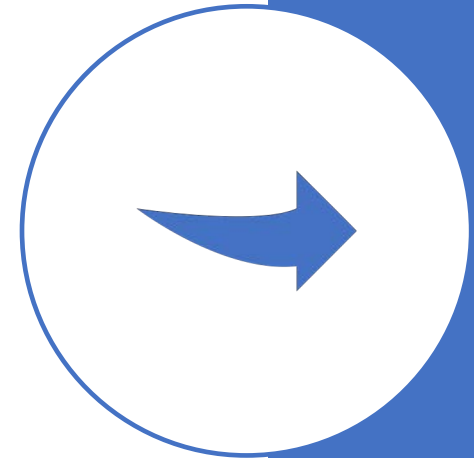
- “There was also more of a focus, I think, on teamwork in both of our classes. Because you did that with the game...And I did that with many of the puzzles. Got into teams, instead of individuals as we had in the past,” (T16 - T3 - 97).
- “I have to say, I think about it. I intentionally do not bring it into the lesson because I'm thinking they need to discover things as they're playing the game....I want the game to have these fresh parts,” (T14 - T3 - 60)
- “I feel like I haven't been pounding in the history so much...I mean dates and specific things... and [instead] getting them to think more about how that time relates to our time now or how they would feel during that time period,” (T14 - T1 - 70).

Teachers as Designers

- Brainstorming with researcher on how to improve game
- “Even our clicker activity, it is really nothing more than a pencil paper... put up on a smart board. Using more modern technology but really, it's the same outcome. The same way it is achieved except you're pushing a button instead of pushing a pencil,” (T13 - T3 - 77)
- Any type of literature, you could bring [GBL] into...all the stories that we read, I'm sure we could do something with black history month... something could tie in with that,” (T17 - T3 - 259)

Implications

- This study cannot be offered as an additional study of GBL efficacy on learning outcomes. (Instruments don't allow for that)
- CEG can have complex, inter-relating effects on students (motivation, ownership, schema activation) and teachers (incorporating games, encouraging student-student learning)
- This study suggests that Vygotsky's pivot theory may be used as a framework to understand how learning is influenced by games
- This study is rare in that it examines GBL within the full learning ecosystem, including its influence on teachers.
- This study suggests that flow and magic circle are useful constructs to consider in game design.
 - Perceived level of enjoyment
 - Quality of partner experience
 - Perceived quality of the game (ie. Design is important!)



Future Lines of Inquiry

Further study of GBL for social studies

Development of better assessment tools to study GBL in early elementary students

Consideration of alternative learning assessments for early elementary GBL

Continued study of GBL within the full context of a curriculum

Further study of the relationship between geospatial understanding and GBL, particularly for history since it is geo-referenced.

GAME OVER

THANK YOU FOR PLAYING!

Questions,
comments, &
feedback?

