PROPOSAL: LEARNING GEOGRAPHY USING GBL

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MOTIVATION AND CONTEXT

The problem I have chosen to tackle is learning of geography via game-based learning (GBL).

A game that has always fascinated me is "Where in the World is Carmen Sandiego" ("Where in the World is Carmen Sandiego," n.d.). In this game you have to solve clues and jump from city to city. This allowed me to know and learn about exotic cities and sowed in me an interest in geography that has stayed with me. So, when I joined EduTech and was exploring topics for GBL; learning geography using GBL a la Carmen Sandiego jumped at me.

As part of my research, I read about a 2014 National Assessment on Education Progress that essentially said that the learning outcomes from teaching geography have been flat since 1994 (US Department of Education, 2014) , and a 2015 report that social studies teachers spend 10% or less of their time on geography (Government Accountability Office, 2015). This means that time spent on teaching geography is really limited. However Geographical Association's "manifesto", A Different View, makes a compelling argument on importance of stimulating conversation about geography in schools (*a different view*, 2009).

I started researching on use of GBL for geography. I read about increased scores when learning geography via GBL in a study done in 2012 (Asaolu, 2012). Another study done in Amsterdam done using GBL along with GPS based triggers also found increased motivation (Huizenga, Admiraal, Akkerman, & Ten Dam, 2009). Another paper on learning geography via gamification which had students as agents of gamification also found increased student motivation (Lotherington & Ronda, 2009).

Nicola defines games-based learning as "learning that is facilitated by the use of a game" (Whitton, 2012) and includes simulations, virtual worlds, role play activities, puzzles and stories. It provides theoretical requirements for learning, including being challenging but achievable, explicit goals, measurable outcomes, rules, interaction, feedback, safe environment, competition, and collaboration. An exhaustive literature study on education games and their effectiveness from 2002-2012 (Hendrix & Backlund, 2013) found increased learning motivations using GBL, but learning outcomes were mixed. It found that educators were more comfortable with specialized education games and software, rather than off the shelf products. Frossard and Barajas in their paper also mention that during analysis phase of introducing GBL, for 13 of 16 teachers, examples of similar works provided a clear vision (Frossard & Barajas, 2011).

The above research has helped me firm up my mind on using GBL to teach geography.

PROPOSAL

I have chosen development track for my project, and the project proposal is a GBL application to teach geography. From anecdotal accounts, learning geography can be a dull experience. Learning geography many times becomes a succession of facts which one needs to memorize.

My project aims to create a geography client application which loads its content from a JSON file. I am planning to work on creating a NodeJS based client application to help me get started and get the flow right; before I try to create a simple Android application for the same.

The game will start with a scenario where a thief has stolen an artifact; and you have to catch the thief via answering a set of geography-based questions. Every correct answer gets you closer; every wrong answer gets you farther away. Each question would multiple a person who has stolen an artifact and is jumping from city to city. As the thief jumps from city to city, you get hints on next city and have to decide between 4 alternatives. Each city you get some clues on the next city, for example - "You find a Library of Congress leaflet". Using the hints, you decide the next city. You have to choose between 4 cities at any point in time.

To make it more interesting, as you reach a city, you visit different points of interest, which show up with some information about the place, with an optional picture. For example, you visit San Francisco Golden Gate bridge, and it contains a blurb about the bridge with short history and fun facts. So, while reading and playing the game you are also learning.

The main intent is to not just create an application, but a framework for geography-based application where the educators are in control over the content and the level of learning.

Rough planned gameplay:

- Start with a screen which has 2 buttons, student and teacher
- Pressing student button takes you to a page where chooses choose tag; and give a username and start playing
- The game is preloaded with US Geography module with information about US cities
- Start with a common back story and start answering question as they appear
- Store the progress in memory
- Pressing teacher button allows you to see students playing with particular tag and their progress; as well as create new tags

To make it interesting to students, the following elements in the client application are planned if time permits:

- Catchy music and image when starting application
- Each time you start a quest, a new music and a back story
- Each time thief jumps to next city, a new music
- Choosing a correct city gives you a nice music
- Each fact about a place is accompanied by an optional link which a student can click to learn more

Things I want to incorporate into the application from ground up:

- Extensibility via metadata driven gameplay
- Monitoring and feedback from student to teacher in app
- Feedback from educator screen to developer (Give Feedback, File Bug etc.)

Additional extended content if time permits:

- NodeJS based REST server

- Client connecting to server to download new content

Things not being planned because of time constraints:

- Persistence of data between app startups
- Content can be created and uploaded in metadata driven json files
- Local language support
- Public and Private content segregation via login and separate links when starting play
- Optional discussion board for each group (for example, acme-district:bell-elementary:mrs-rubin)
- Discussion board between educators at each group (for example: acme-district
- Ability for students to play same content with different levels of difficulty
- Flyover when going from city to city

Details of tags and their implications:

- The areas for school district/schools/classes can be kept separate using separate tags
- For example, acme-district, acme-district:bell-elementary, acme-district:bell-elementary:mrs-rubin
- The students would be given access to “acme-district:bell-elementary:mrs-rubin”, so they can access information from that class, and also from parent groups (acme-district and acme-district:bell-elementary) but not another class in same school, unless given permission explicitly
- The group also serves to keep tab on how each student in the group is doing

The following deliverables are planned as application deliverables:

- Data structure design information
- North America cities metadata for playing
- Sample NodeJS client to test the flow
- Android app to play
- All of the above in a GitHub repository with a ReadMe

Planned source of information:

- Sounds downloaded from (free for non-commercial use): https://freesound.org/browse/tags/sound-effects/
- City information from https://wikitravel.org/en/Main_Page and https://en.wikipedia.org/wiki/Main_Page
- Places to travel information sourced from https://www.tripadvisor.com/
- Optional city images downloaded from (free for non-commercial use): https://www.pexels.com/search/city/

The final aim is to have a server from which the client will get dynamic content, but that is outside the scope of this project.

INTERMEDIATE MILESTONES

INTERMEDIATE MILESTONE 1

A playable NodeJS client application using US Geography cities information. The NodeJS client is done as a fast prototype to get the metadata as well as to get feedback for the Android app.

Some elements not present in NodeJS application would include tag segregation; student vs teacher segregation; music etc. This is a basic proof of concept of how the gameplay will feel like in the actual Android application.

For future weeks, this will also act as a testbed to make sure changes I make work; so it removes extraneous UI concerns when I hit issues with Android app.

INTERMEDIATE MILESTONE 2

A playable Android application for teaching geography using GBL. This will be loaded with US Geography cities information. Bugs are expected, and UI is expected to be alpha-quality.

The following elements are still optional – music and teacher vs student segregation and feedback mechanism.

This will also act as final chance to get feedback before the final project deliverable.

WEEKLY TIMELINES

Week/date	Assignments	Weekly deliverable
Week 1 (March 5th)		- Design data-structures to hold metadata - Design NodeJS client to get interaction correct - Design basic Android UI wireframes
Week 2 (March 12th)		- US Geography city metadata started - Start implement client via terminal NodeJS client - Feedback loop into Android app design
Week 3 (March 19th)	Intermediate Milestone 1	- Stable US Geography city metadata - Sample playable client using command line NodeJS application - Feedback loop into Android app design - Get started on Android app implementation
Week 4 (March 26th)	Incorporate review feedback from intermediate milestone 1	- Basic running Android app
Week 5 (April 2nd)		- Continue Android app progress
Week 6 (April 9th)	Intermediate Milestone 2	- Playable rough Android app
Week 7 (March 16th)	Incorporate review feedback from intermediate milestone 2	- Incorporate feedback into Android app - Get started on final project paper
Week 8 (March 23rd)		- Decide final look and feel and implementation for Android app - Bug fixes for app - Work on final project paper - Work on final presentation
Week 9 (March 30th)	Final Project; project paper; project presentation	- Final polish on app; paper and presentation

CONCLUSION

Unfortunately, a 100-hour effort is not sufficient to make a full-fledged elegant application as well as write a paper on that. However, I will attempt to create a proof of concept and am planning to open-source whatever I do; so, someone from future semesters can pick this up and extend whatever I do.

I plan to have ReadMe and a Vision document in the GitHub repo along with the final project deliverable, so someone can take this further if they are interested.

BIBLIOGRAPHY

a different view. (2009). Retrieved from https://www.geography.org.uk/download/GA_ADVBookletFULL.pdf

Asaolu, O. S. (2012). International Evaluation of a Localized Geography Educational Software. *African Journal of Computing & ICT*, *5*(4), 43–48. https://doi.org/10.4018/jgc.2010070104

Bourgonjon, J., De Grove, F., De Smet, C., Van Looy, J., Soetaert, R., & Valcke, M. (2013). Acceptance of game-based learning by secondary school teachers. *Computers and Education*, *67*, 21–35. https://doi.org/10.1016/j.compedu.2013.02.010

Frossard, F., & Barajas, M. GBL design for enhancing creativity in the classroom, Proceedings of the International Conference on Game and Creativity in education and Training (GACET 2011) § (2011).

Government Accountability Office, U. S. (2015). Most Eighth Grade Students Are Not Proficient in Geography, (October).

Hendrix, M., & Backlund, P. (2013). Educational Games – Are They Worth The Effort? *Games and Virtual Worlds for Serious Applications (VS-GAMES)*, (December), 1–8. https://doi.org/10.1109/VS-GAMES.2013.6624226

Huizenga, J., Admiraal, W., Akkerman, S., & Ten Dam, G. (2009). Mobile game-based learning in secondary education: engagement, motivation and learning in a mobile city game: Original article. *Journal of Computer Assisted Learning*, *25*(4), 332–344. https://doi.org/10.1111/j.1365-2729.2009.00316.x

Lotherington, H., & Ronda, N. S. (2009). Gaming geography : Educational games and literacy development in the Grade 4 classroom Authors. *Canadian Journal of Learning and Technology*, *35*(3), 19. https://doi.org/http://dx.doi.org/10.21432/T2688N

US Department of Education. (2014). 2014 Geography Assessment. Retrieved from https://www.nationsreportcard.gov/hgc_2014/#geography

Where in the World is Carmen Sandiego. (n.d.). Retrieved from https://classicreload.com/where-in-the-world-is-carmen-sandiego-deluxe-edition.html

Whitton, N. (2012). Games-Based Learning. In N. M. Seel (Ed.), *Encyclopedia of the Sciences of Learning* (pp. 1337–1340). Boston, MA: Springer US. https://doi.org/10.1007/978-1-4419-1428-6_437