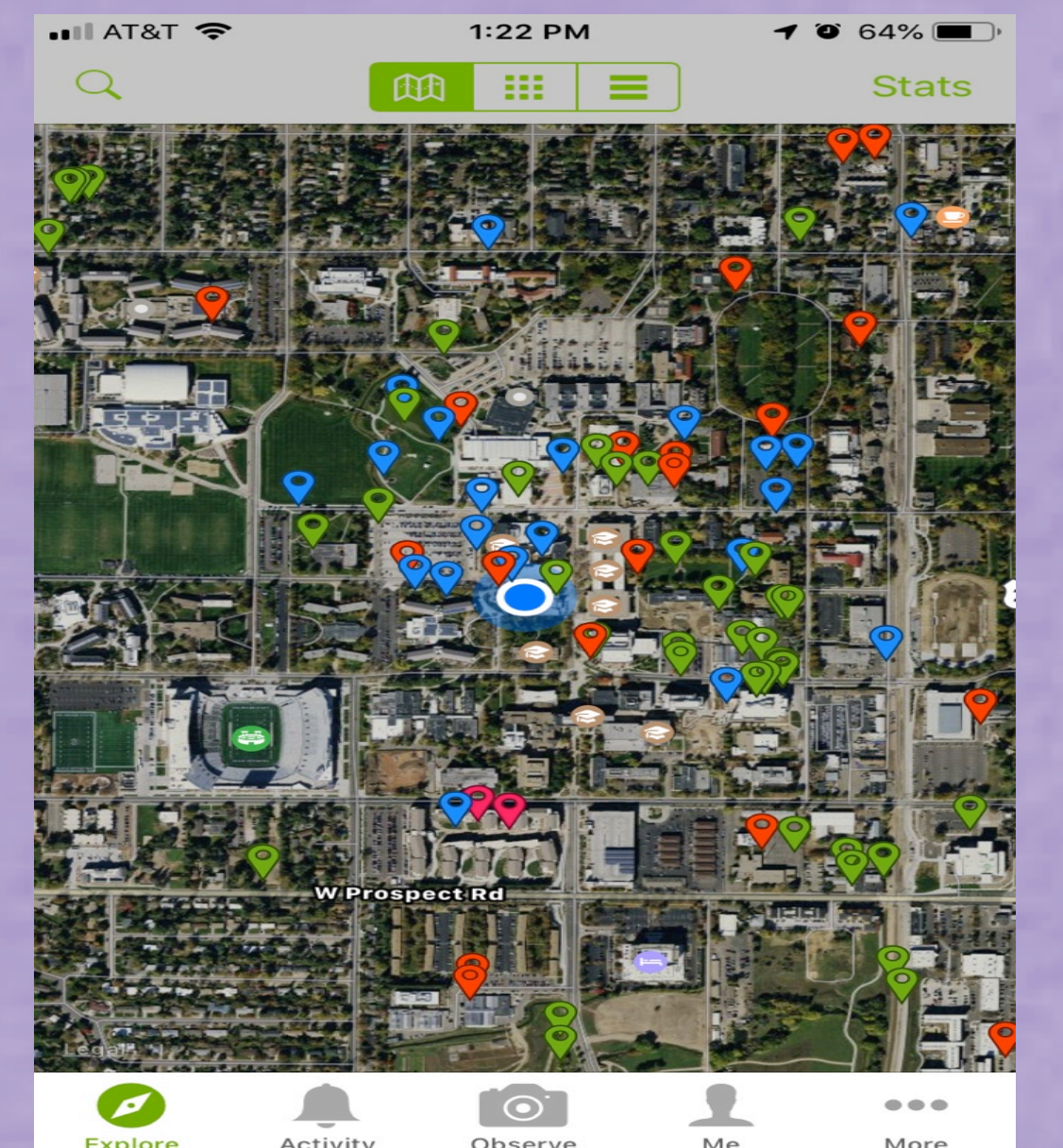


A screenshot of a PokéStop on CSU campus.

# Engaging reality: Examining how location-aware mixed reality mobile apps and games influence sense of place for a more engaged citizenry

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A screenshot of the iNaturalist map, showing submissions by other users.

## Introduction

Following Niantic's successful 2016 launch of *Pokémon Go*, location-aware mixed reality (often called augmented reality) mobile apps and games are projected to continue to grow in popularity and prominence. It is unclear how this may impact people's engagement with their surroundings, with concerns that mobile technology is disconnecting people from the world around them. It is possible, however, that some app functions may influence sense of place development, making users more likely to engage with their environment.

## Theoretical framework and concepts

Location-aware mixed reality apps: GPS-enabled apps that use the user's real-world location data to deliver location-specific information (audio, video, text, pictures, etc.) alongside real-world information.

Sense of place (SOP) theory: A person's sense of what a place is like (sense of place) is built on everyday lived experiences and patterns of social experience in place. People with strong, positive SOP are more likely to engage in maintaining or improving that place. SOP is made up of:

- *Place attachment* (affective experiences like interest in place, social interaction, and sense of uniqueness)
- *Place dependence* (conative experiences, like exploring, doing activities, and prosocial behavior)
- *Place identity* (cognitive experiences, like knowing physical and social characteristics, and self-efficacy)

## Research questions

RQ 1: How do location-aware mixed reality mobile apps and games influence the development of a sense of place among users?

RQ2: What elements of location-aware mixed reality mobile app and game design promote sense of place among users?

- RQ2a: ...place attachment?
- RQ2b: ...place dependence?
- RQ2c: ...place identity?

## Results

Connection with a **community**: Game app users felt connected to a community of other users, and most participated in external chat communities with local players. Co-op game elements also encouraged social engagement and coordination. *iNaturalist* users felt connected to other citizen scientists and nature lovers.

Social learning: *iNaturalist* users liked learning about local nature from other users' comments on their observations and liked seeing and commenting on others' observations. Game users talked about learning about good locations to play from other users.

Time spent in place motivated by app: Users went to certain locations more often and spent more time in those locations in order to use their apps. For game users, these were especially locations with many game nodes.

Noticing or interest in seeing app objects in the real world: *iNaturalist* users were already motivated to find nature, but said they were noticing more types of species and more species they'd seen in the app. Game users tended to notice physical features of place like murals and statues that are often attached to game nodes, or were interested in seeing the objects in the real world.

Motivated exploration of new or familiar places: Game app users were motivated to explore to play or find new game nodes or objects that needed to be turned into game nodes. *iNaturalist* users were more motivated to go for more hikes/walks to observe more nature or return to earlier observation spots.

Supplementing activities they're already doing: App users liked using the app during chores, hikes, walks, commutes, and daily activity as an enhancement they could do anywhere.

Knowing best places to use app: Users knew the best places to play or make nature observations. For game users, these were mostly walkable areas with many game nodes.

Affect toward place: Users talked about places, nature, and objects discovered during app use in positive terms, and generally felt positive affect toward their place and places they spent time.

## Method

- 3 location-aware mixed reality mobile apps were selected (*Ingress* [game], *Pokémon Go* [game], *iNaturalist* [non-game nature observation app])
- Respondent interviews
  - 4 for each app, self-selected participants (age 20-65). Recruitment texts were posted on Reddit forums and Facebook groups related to the apps
  - Interviewed about their use of one of the 3 apps
- Coding
  - 2 rounds of coding with a single coder
  - Round 1 used a codebook developed from SOP literature. Round 2 used *a priori* codes

## Discussion

App use related to place attachment (affective) by connecting with interest in place, place uniqueness, social interactions, and emotion toward place. It related to place dependence (conative) by giving users a new activity to do in places, connecting them with a user community, making them more aware of unique features, and encouraging exploration and spending time in place. It related to place identity (cognitive) by helping users be more familiar with surroundings and increasing a sense of efficacy for some users.

## Study limitations

- Only considers 3 apps
- *iNaturalist* is very different than the games
- Exploratory research
- Self-selected participants from Reddit/Facebook may be more social or more motivated users
- All users were from large cities
- Does not consider people under the age of 18

## Implications & future directions

Based on the findings of this study, the potential for location-aware MR mobile apps and games to positively influence user SOP is high. User motivation and app design are important factors in how users experience the real world while using the app. Future studies that measure SOP changes during app use would benefit this field of research.