Engaging the Urban Classroom with the Natural World

Lessons Learned During a Pandemic

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Abstract

In this paper, the authors discuss an environmental education learning framework which was developed for an experiential course (an "[Un]Class"). Lessons learned are shared from teaching the course in an unintended blended in-person/online format as a result of the COVID-19 pandemic which occurred in Spring 2020. Impressions were developed from classroom observations along with an analysis of course assignments and a follow up focus group interview with students. Our continued work explores whether or not an urban university-level course, such as this [Un]Class, which brings preservice teacher candidates and biology majors out into nature in an experiential manner, impacts their likelihood to include such activities into their future (formal or informal) science instruction and more fully engage their own students in urban environmental learningscapes.

Key words: Science communication; field station; experiential learning; place based education; environmental education; STEM.

Background

In universities without formal environmental education (EE) classes or programs, exposing teacher candidates to natural settings for their required coursework can often be overlooked and challenging. Based on existing research, we can document that K-12 students from urban school districts are less likely to be exposed to nature and field-based experiences, thus we believe better preparing future teachers and interpreters to share their nature and environmental knowledge and skills can help bridge this opportunity gap (Heimlich, et al., 2017; Hughes, et al., 2019; Kuo, et al., 2018; McKeown-Ice, 2000). For the purposes of this paper, 'urban' will be defined as an area or school district with both socioeconomic differences

and "place differences" or areas with less access to land available for outdoor learning experiences (Parker et al., 2018). While this study takes place in an urban school district, ample opportunities for high quality park systems do exist regionally but access is not always easily obtainable for individuals in lower socioeconomic brackets. That said, in our study, there was an emphasis on utilizing local open spaces such as school yards and neighborhoods.

There have been numerous studies that have demonstrated that engagement with the outdoors not only enhances student learning but impacts teacher confidence and efficacy in using those settings for their own science instruction (Carrier, 2009; Lewis & James, 1995; Trauth-Nare, 2015). That said, preservice science teachers often lack the confidence to teach in outdoor settings, indicate discomfort with those settings, and have little understanding of the environment and environmental science (Barrable & Lakin, 2019; Bodzin, et al., 2010; Hug, 2010; Yavetz, et al., 2014). In order to move beyond such barriers, intentional inclusion of environmental education methods and skills (e.g., field trips, community service projects, and participation in outdoor science) should be incorporated into the coursework that prepares preservice teachers for student teaching and beyond (Tal & Morag, 2009; van Dijk-Wesselius, et al., 2020). "Through hands-on immersion, prospective teachers can feel and be motivated by the energy and enthusiasm children have for the natural world" (p. 9, Powers, 2004). However, it is not enough to simply have resources, methods, and skills specific to environmental education, they need to be integrated into preservice teacher preparation programs (McDonald & Dominquez, 2010).

In addition, research shows that boys and girls from marginalized and historically disadvantaged groups— such as Black, Indigenous, and People of Color (BIPOC) and students in poverty—are less likely to have access to and to pursue advanced coursework in math and science (Babco, 2003; Cole & Espinoza, 2008; Crisp, et al., 2009; Gandara, 2001; NRC, 2005; Tsui, 2007). This lack of access makes it more difficult for them to enter and be successful in Science, Technology, Engineering and Mathematics (STEM) majors and careers (this includes those with a focus on the environment). Research also shows that we need all voices at the table (racial, social, cultural, economic, age, gender, orientation, education level, geographic, religious, etc.) to help increase workplace productivity and idea generation (Lambert, 2016; Saxena, 2014), two crucial factors that help the human race address complicated and pressing environmental issues like climate change, plastic pollution, and worldwide species extinctions. However, there is also ample research to show that BIPOC and women are often left out or left behind in STEM fields, effectively limiting the diversity of voices that will be invited to even sit at the table (Bell et al., 2018). It's a frustrating conundrum. Because beyond identifying the barriers to inclusivity, the real question for us remains: how can we help inspire students to not only learn to tolerate being out in nature, but to love nature enough to pursue it as a major in college, find a job in the field sciences or science education (often very competitive and low paying), become an expert in their field so they can sit at the proverbial problem-solving table, and be an educator, role-model, and mentor for all of the scientists and naturalists following behind them?

Although students do not take their first discipline-specific class until their freshman or sophomore years in college, the reality is that many students decide

on a major much earlier in life. A stated interest in STEM by eighth grade is more of an indicator of pursuing a STEM degree than math or science test scores (Dabney et al., 2011; Tai et al., 2006). Additionally, if students are not excited or informed about STEM disciplines while in middle school, they will make class/activity choices that may preclude them from a future in a STEM field (BGCA, 2014). Further, engagement of BIPOC community members in environmental education programs is essential (Lewis & James, 1995). Carter and Simmons (2010) stated that "environmental education begins close to home" (p. 12) and that ultimately, "the goal of environmental education is a democratic society in which environmentally literate citizens actively participate" (p.12). Furthermore, they state that creating specific teacher preparation programs that encourage environmental literacy has been a challenge.

This is why we felt it was important to provide EE experiences and engagement with the outdoors for our middle level preservice teacher candidates who have been trained in an urban school setting and who have indicated a desire to continue working in such educational environments. However, during the midst of teaching a semester-long EE course, steeped with experiential learning opportunities and outdoor experiences, there was the COVID-19 pandemic during Spring 2020. As a result, the remainder of the course was taught online. We wondered how an online experience was going to impact middle level preservice teachers and their relationship with nature or outdoor education and how might they incorporate EE into their future work with urban learners.

Participants

The course participants were 10 (3 male, 7 female) middle level (Grades 4 - 9) preservice teacher candidates, primarily in the Junior or Senior year of their licensure program, which consists of required coursework in two content areas (science, mathematics, language arts, or social studies) in addition to pedagogy coursework. All of the participating students were preparing to be licensed in science and required courses for such students include biology, chemistry, physics, geology, astronomy, and environmental science. There were other undergraduate students enrolled in the course, majoring in biology, as well as two graduate students, majoring in education and history. However, the focus in this paper is on the middle level teacher candidates (n=10).

Description of the Course

This study took place at a large public, urban, university in the Midwest USA where a novel course offering was implemented using established programs, facilities, and centers. Specifically, the university's resources included an experiential learning center, an urban STEM center, and a locally accessible off-campus field station located within a nature preserve. The framework for this type of course is called an "[Un]Class". By their design and nature, [Un]Classes are cross-departmental both in instructor and student make-up, interdisciplinary, and allow for small class sizes and active student involvement on topics that would not be normally found in the university's course catalog. In addition, students play a large

role in how the course is structured and unfolds.

The course focused on activities from the field of environmental education and was designed to help preservice science teacher candidates build connections from nature to their classroom (whether formal or informal). Course participants were able to learn about and become certified in pre-existing nature-based curriculum like Project WILD (Council for Environmental Education, 2014), Growing Up WILD (Council for Environmental Education, 2016), Aquatic WILD (Council for Environmental Education, 2005), Project WET (Project WET Foundation, 2011), and Wonders of Wetlands (Kesselhelm et al., 1995). There was also a focus on how to deliver impactful STEM content to various audiences (i.e. children and adults in both formal and informal environments), including Problem Based Learning (PBL), and determine the best way to assess these types of interactions. The class met at the off-campus field station and included activities within the nature preserve as well as trips to other park systems, including a national park, and local agencies (i.e. the natural history museum). Local field trip experiences with K-12 school learners from a partner school district were also incorporated into the course. Again, this particular school district is designated as 'urban' because it is associated with a mid-sized city, with student demographics listed as 46.5 % Black, 32% white, 8.4% Asian/Pacific Islander, 8% multi-race, 4.5% Latino, and 0.6% other.

The purpose of this [UnClass, titled "All the World's a Classroom" was to bring together students from disparate majors (in this case it was open to all majors but cross-listed in Curricular and Instructional Studies and Biology) and to expose them to science communication, teaching, and learning in non-traditional, informal settings (local parks and museums). We provided them with a variety of resources and experiences that would increase their comfort in these settings in conveying complex STEM concepts to their future students or patrons in engaging and innovative ways.

The overarching goal of the class was to increase students' knowledge of environmental education through a mix of literature review, free nature exploration, hands-on experiential learning, assignments, and place-based field trips (see Buxton & Provenzo, 2012), expert guest instructors, and earned certifications. We focused on how to deliver impactful STEM content to various audiences (K-12; general public) and determine the best way to assess these types of interactions. Due to the circumstances surrounding a global pandemic, the experiential nature of the course shifted mid-semester (around week 10 of 16) and the experiences were seen through a digital lens since students had to complete assignments in a virtual online learning space.

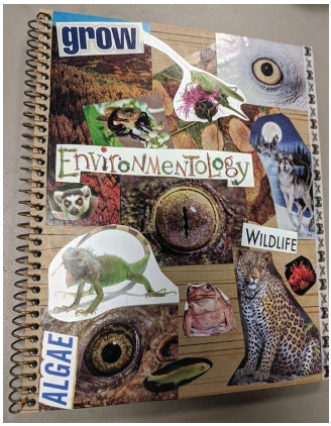
The class met for an extended block of time once per week (2.5 hours). Several different initiatives were utilized in this course in order to achieve the spirit of this experiential, student-driven course trajectory while maintaining some level of oversight on learning objectives. Specifically these initiatives including nature hikes (see Figure 1); semester long nature journals (Campbell & Fulton, 2014); participatory activities through EE curriculum; directed readings on environmental education and informal science pedagogical theory; required responses to articles and videos (i.e. "Media Responses"); peer teaching through a natural history handout and class presentation (i.e. "Research Project"); self-directed EE curriculum assignments at home; a community based action-focused initiative (i.e. "Upstand-

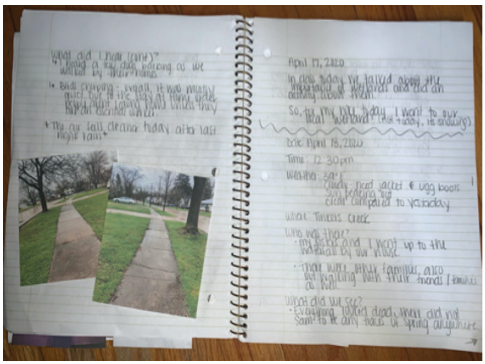
er Project") and final team projects (i.e. "Curriculum Kits") based on appropriate state and federal learning standards. Other features of the course included field trips to various informal science organizations (museums, parks, and camps), guest experts, and certification in several nationally recognized EE curricula.

Figure 1 *Nature Hikes*

Specific activities were chosen to highlight the important connection between humans and environment - this is a key factor in developing a personal and impactful relationship with the land (Leopold, 1949). These included weekly hikes (guided or in small groups); the creation of personal nature journal entries (through an art project); the required usage of those journals through field entries (see Figure 2); and topic specific EE activities (examples include: 'Reading the Landscape' - Leopold Education Project (Aldo Leopold Foundation, 2016); 'Incredible Journey' - Project Wet (Project WET Foundation, 2011); 'Wetland Metaphors' - Wonders of Wetlands (Kesselhelm et al., 1995); 'Bird Beak Buffet' - Growing up WILD (Council for Environmental Education, 2016); Biomimicry Exploration - Field Station Developed; etc.)

Figure 2 *Examples of Students' Nature Journals*





Other assignments were specifically designed to increase knowledge about the field of environmental education. There were assigned readings and associated Media Responses where the students were asked to reflect on their interpretation of the literature by elaborating on the leading statements "The Text/Author Says" and "I Say" on at least three passages from each article and write summary statements. Other activities focused on knowledge development included the participation in EE example activities, visiting guest experts, field trips to meet with informal science professionals, and field trips to respected institutions such as a local natural history museum and an overnight camp. Furthermore, students could elect to get certified in and therefore receive guides for existing EE curricula - Project WILD (Council for Environmental Education, 2014), Growing Up WILD (Council for Environmental Education, 2016), Aquatic WILD (Council for Environmental Education, 2005), and Wonders of Wetlands (Kesselhelm et al., 1995).

Many of the assignments were chosen based on the allowance of substantial student choice or the ability to go in many different directions. To this end, although we had rubrics for the Research Projects, Upstander Projects and Curriculum Kits, students were allowed to choose their own topics and thus they showed a variety of interests and perspectives.

As previously mentioned, mid-semester the class had to transition to at-home virtual learning, which initially for an "experiential, hands-on" class felt a bit like a death knell. The students were asked to shift to this new pandemic-inspired format by first joining class for a virtual weekly check-in which was truncated in length from a normal class. This gave us all an opportunity to briefly go over weekly assignments as well as to answer any questions, and maintain some connection with students other than just through email or the university-sponsored online learning platform. They also had to record their Research Project presentation to share with the class and the development of the final project (Curriculum Kits) became an online activity, as opposed to the creation of an actual physical activity box. Students were expected to continue to explore nature on their own time, keep up with the field journals, and complete required readings and assignments during the remainder of the scheduled class time or throughout the week.

The Curriculum Kits were redesigned to be digital, using Google Sites, to include necessary background information, connections to state standards, clear descriptions of the proposed activities, assessments, supply list, required materials, supplementary resources, books, plenty of interesting visuals, etc. Students mostly worked in pairs and were given feedback before final submission. The topics included: Tree Families, Painting with Soil, Polluted Display Jars, Think Like an Early Ohioan!, Plant Cells and Their Functions, Introduction to Ornithology, Animal Tracking, and Food Chains and Food Webs. The intent was to have the kits be complete enough so that teachers and families could use the content and materials in a digital format. The kits were made available through a university sponsored press release and a newspaper article was published, which led to several local teachers indicating interest in the kits.

Additional Data Sources and Analysis

In addition to the course assignments described above, a focus group interview was conducted three and a half months after the course ended. Considering that the pandemic was still at large, the hour-long focus group interviews were conducted using an online meeting/video conferencing platform. The following questions were asked and the participants were able to respond to each other:

- Have you continued your nature notebook/field journal? If yes, tell us about how you've worked on the journal? If no, tell us why you haven't continued.
- Have your own outdoor experiences changed since the class?
- Has the pandemic influenced your personal attitudes and behaviors toward the outdoors? (If so, how? If not, why not?)
- Where do you anticipate applying for teaching positions (urban, suburban, rural)?
- How do you anticipate/see yourself using outdoor education in your future classrooms?
- Where do you see yourself conducting these activities (classroom, school grounds, virtually, field trips, other)?
- Which specific activities/experiences from the course do you plan on using?
- Why does this method of experiential teaching/learning matter to you and/or your future students?

The data were analyzed using a constant comparative approach along with an inductive analysis. Using the focus group responses and course assignments, we looked for emerging themes and patterns that may be distinct for this group of preservice teacher educators. Focus group responses were transcribed and entered into an Excel spreadsheet. In addition, relevant quotes from assignments were included into the spreadsheet. Initially, to identify themes, the responses from all participants were reviewed at the same time and in random order. The resulting themes and subthemes, along with examples of responses for each, can be seen

below. At this point, each statement was coded including the participant name (a pseudonym) and then the data source (i.e., Joe. Focus_GroupQ1).

- *Increased Perception/Observation* - "I was always connected to nature but it's now intensified" (Greta. Focus_GroupQ2).
- *Curiosity (subtheme)* - "more outdoors during free time … more curious … more interested" (Naomi. Focus_GroupQ2).
- *People Interacting with Nature More Often* - "I've noticed more people while visiting parks" (Elizabeth. Focus_GroupQ2).
- *Benefits of Being Outdoors (subtheme)* - "I found that being out in nature is rejuvenating for the mind, body, and soul" (Marjory. Upstander_Project).
- *Incorporation of Outdoor Education into Teacher Practice* - How are students expected to have positive feelings towards nature, if they never go outside and explore it? (Donella. Media_Response8).
- *Online Learning Incorporating Outdoor Experiences (subtheme)* - "there are ways to use nature with technology" (Gus. Focus_GroupQ9).

Results

Increased Perception/Observation

Almost all of the participants' mentioned they were more "more interactive and observant in nature" (Aldo. Focus_GroupQ1) as a result of being in the class and this behavior continued through the summer. This was amplified due to the COVID-19 pandemic and study participants actively engaging with outdoor experiences since they were spending so much time indoors as a result of social distancing and protective measures. While not everyone continued with the nature journals (i.e. Naomi, due to a heavy work schedule), everyone noted that they felt more observant when they were outdoors. A particular activity conducted during the class (before distance learning was enacted) was mentioned by multiple people. This was done while at an educational center in a nearby park and it involved each person selecting a leaf, observing it very closely (using a hand lens) and then turning to their neighbor in order to describe what they noticed on their particular leaf. This experience helped the students see what is often overlooked, in something 'small' like a leaf, and the importance of taking the time to look closely. As Elizabeth stated, her outdoor experiences "expanded in the sense of not only appreciating the outdoors, but being aware of your surroundings in them as well. I do notice the 'small' things more" (Focus_GroupQ2).

This sentiment was supported by Naomi when she responded to a reading

earlier in the semester…

> I [selected this quote] because it emphasizes the importance of not only observing nature, but sharing these observations with others so we can use them for a greater good. (Naomi. Media_Response4).

Curiosity (subtheme). As a result of this intensified perception of nature, participants' curiosity about the environment was also piqued.

> My outdoor experiences have changed 100% since this class. In the beginning, I was completely closed off to nature as a whole. For an example, I wasn't interested about studying animal tracks, learning about different [sic] or simply just going outside. This changed tremendously through the duration of our class. Now, I see myself getting super excited about realizing different things and how they work in the world around us. (Donella. Focus Group_Q2).

As Donella notes, for her, increased curiosity was a by-product of spending more time outdoors. The face to face classes always incorporated a hike during the classes and study participants continued to walk around their neighborhoods, hike in the parks or explore more natural spaces. In particular, Donella was initially reluctant to participate in the hikes but that changed over time. As Rachel states "It's all about the inspiration, the awe, the wonder" (Nature Journal).

People Interacting with Nature More Often

While participants were spending more time outdoors themselves, it was noted that other people were seen out in parks and in nature as well. During the focus group interview, Aldo (who works as a nature guide at the national park nearby) said that the park's attendance had gone up 162% since the start of the pandemic and he felt that this was due to a "new appreciation" for nature and that "there's not much else to do". This was seen by some to be a very positive thing. At the same time, there was anxiety due to the uptick in people using outdoor spaces. Rachel noted that the "pandemic forces you to do something different to stay away from people – hiking, trail running, etc." but she also explained further that it was "harder to avoid people in nature" and that it made her "uncomfortable" since they weren't "following the rules and it was not as fun" (Focus_GroupQ2). Naomi was actively "looking for new places to relax where there are less people" (Focus_GroupQ2&3). Other pertinent human/nature observations included that in one sense, the natural world on a global scale was responding positively to less human impact because of the pandemic (Donella. Upstander_Project), while others still noticed more local pollution in natural areas due to increased usage and felt compelled to engage in stewardship action in cleaning up litter on her hikes (Elizabeth. Focus_GroupQ3).

That said, the overall impression was that study participants felt people should be more involved in outdoor activities, especially during these challenging times. Aldo explained in his Upstander Project that …

> One way that we can foster a sense of connection to nature… is to provide multi modal experiences to citizens who are currently stuck at home due to the coronavirus

> pandemic. This will give citizens something to do during quarantine while also educating them on the nature around them!

Benefits of Being Outdoors (subtheme). The benefits of spending more time outdoors were also noted frequently. For example, "nature is healing" (Rachel. Focus_GroupQ8). However, while the benefits were seen as personal "I found that being out in nature is rejuvenating" (Marjory. Upstander_Project) such benefits were extended to the educational setting as well, for both students and teachers …

> The mental health of a teacher is just as important as the children there. Of course, we put students first, but how can a teacher teach effectively if he or she is not fully in balance? Simply put, the outdoors is a natural prescription for positivity. (Greta. Media Response_8).

For students, the benefits of having contact with nature is seen to help reduce stress and "how a classroom affectively [sic] functions" (Harriet. Upstander_Project). These sentiments can also be seen when participants talked about incorporating the outdoors into their future teaching practice.

Incorporation of Outdoor Education into Teacher Practice

The overall consensus among participants was that it was important to include outdoors experiences into their future instruction.

> Teaching lessons in nature provides unique opportunities for students to engage in their surroundings and become immersed in the classroom content. With the ability to see, hear, touch, and smell the content discussed in class, it also takes their full attention. Because of their increased interest and attention to the content, teachers can do much more in less time. (Aldo. Media Response_8).

Equally interesting, participants also began to realize that it would not be difficult to do so. Using nearby natural settings, even the school grounds, would be important in order to get "students out there" (Greta. Focus_GroupQ5). Recognition that there are green spaces within urban environments that can be used for instruction or to foster advocacy for the environment was also apparent. As Rachel stated "students' curiosity stems from their home life and their role models. They need someone else to be excited about science first so that they can see it is not at all bad" (Upstander_Project).

Further, it was felt that PBL strategies could be incorporated to "teach problem solving, get outside, and have it be hands-on" (Greta. Focus_GroupQ5).

> Some students may have never been given the opportunity to leave the city and it could really open their eyes. I think it's also important to let them know that they don't have to leave the city to still be able to care about the environment and enjoy certain aspects of nature. (Harriet. Media_Response6)

> You don't have to make a whole field trip to a nature preserve to get your students involved in the environment. If the school is nearby a patch of grassy fields or trees, sometimes that's all you need to incorporate an environment-based lesson. (Greta. Media_Response3).

Online Learning Incorporating Outdoor Experiences (subtheme). When the [Un]Class switched to an online learning environment, virtual meeting spaces were used to meet with the students on a weekly basis. However, work with the nature journals continued and this seemed to be an important experience since almost everyone continued working on their journals and spending time outdoors. Using virtual learning platforms does not mean that a disconnect from nature is imminent. "With the pandemic students will be sitting more and spending more time at the computer - EE gets the brain working and the body moving." (Gus. Upstander_Project).

> The goal is not to entirely dispose of technology, but to lessen the amount of screen time and increase the amount of time spent outdoors. [sic] In hopes of the development of an appreciation and love of nature within my learners' hearts and minds, which can lead to proper conservation of our current environment in an ethical view of land. (Naomi. Upstander_Project).

Conclusions

Despite the challenges presented by the COVID-19 pandemic in Spring 2020, the authors feel that the objectives of this [Un]Class were fulfilled through the unintentional blended learning format. The quality of the online assignments, specifically the online Curriculum Kits, far exceeded the expectations of the authors in light of the significant shift from the original intention as physical kits that could be used at the field station with K-12 groups. Also, having assignments (such as the nature journals) that connected the preservice teachers to nature helped continue the emphasis on outdoor, experiential environmental education even while students were learning at their own residences.

The literature has noted that preservice teachers lack confidence, comfortability, and knowledge in environmental science and environmental education or working in outdoor settings. As a result, this could prevent teachers from actively engaging their students in EE (Barrable & Lakin, 2019; Bodzin, et al., 2010; Hug, 2010; Yavetz, et al., 2014). The preservice teachers that participated in the [Un] Class presented here, indicated improvement in these areas and skills sets and built on prior knowledge/experiences.

There have been increased opportunities for environmental education in "informal settings (natural history and science museums), outdoor spaces (school grounds, parks, other native land), and through environmental project-based community" incentives (Bloom et al., 2010, p. 97). However, the inclusion of environmental education methods and skills were also seen as important to include into teacher preparation coursework (McDonald & Dominquez, 2010; Tal & Morag, 2009; van Dijk-Wesselius, et al., 2020). Participants in the [Un]Class indicated that they would continue to incorporate nature exploration and EE strategies into their own classrooms and will use a variety of techniques to engage a wide variety of learner-types. This would include:

- Using different spaces for engagement (classroom, schoolyard, field trips);
- Using EE specific activities (Field Notebooks, Curriculum Kits, Expert

Speakers, pre-existing EE Curriculum);
- Using a variety of delivery methods (digital, as well as face-to-face).

In addition, the preservice teachers in this study felt that incorporation of EE into their future classrooms would highlight a variety of benefits: mental health and well-being of students and themselves; interdisciplinary learning through PBLs in their school community; longer lasting learning; engagement of different learning styles (kinesthetic, visual, etc.); problem solving skill development; modeling positive interactions with nature; and developing environmental stewardship in their students. The skills developed through this course will hopefully empower teachers to get their students out into and interacting with nature, which will be more important than ever as it is predicted that a full 30% of organizations that currently provide environmental education experiences will be permanently shuttered and not survive the pandemic due to budgetary cutbacks (Collins et al., 2020). Unfortunately, it is likely that this reduction in available EE programs will disproportionately affect marginalized BIPOC and low-income communities (Collins et al., 2020). Experiential coursework, such as the [Un]Class described here, can provide opportunities and resources for preservice science teachers to incorporate environmental education into their future instructional practice during these very challenging times, bridging a vital and significant opportunity gap for urban learners.

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