Nineteenth century models of education and learning which dictate that information is passed on from teacher to apprentice in a closed classroom environment seem archaic to us, especially since so much of our experiences are constructed in the outside world. Advances in ubiquitous and calm computing; social and immersive media; and urban locative technologies now allow for embedding complex information into physical environments and thus open up possibilities for teachers to set up carefully tagged student engagements in the real world—in “places” where real scientific phenomena are happening and technological artifacts can be engaged with. However these models are seldom successful because they are employed without an understanding of changing paradigms of learning.

In this paper, we look at several new developments in learning models and use them to develop Just in Place learning, a novel framework which harnesses embodiment, place, and the potential of new locative technologies to augment traditional practice-based learning. Just in Place learning provides new potential for teachers and students to engage with information in “place,” exploit the urban environment as the new classroom, and the built environment as a portal for situated learning.
1 Introduction

In the 1960s, Marshall McLuhan published several essays on media and its effects on education; describing the problem with the twentieth century education model, he says "today's child is bewildered when he enters the nineteenth century environment that still characterizes the educational establishment where information is scarce but ordered and structured by fragmented, classified patterns, subjects and schedules." Educational systems today are based on a model of "uniform schooling"—uniform schooling reflects both fairness and efficiency (Weigel et al., 2009) and has become the method of choice for education all around the world. The problem, McLuhan says, is that this model of education is based on the technology of the printed word (McLuhan 1964/2003) which dictates that information is scarce and has to be made ordered and generic in order to reach a wide range of audience. Much of this learning also happens in the local setting of a classroom, removed from the actual environment where scientific phenomenon can be observed and technological artifacts can be explored. While it is clear that existing institutional structures and traditional classroom environments do not adequately support the potential of media-based learning, it is not merely enough to say that the emergent and organic power of digital learning will supplant years of institutional research and practice-based learning methodologies. We need a model for learning that brings together the practice-based learning methodologies of the current education system with new technologies embedded in the context of the real world.

Take physics education as an example: conventional approaches to physics education that rely heavily on textbook-based computational methods of instruction have strikingly little impact on students' understanding of physics concepts (Hestenes, Wells, & Swackhamer, 1992). Johnson-Glenberg and associates (Johnson-Glenberg et al., 2009) cite several studies which show that while students in middle and high schools are able to generate computational solutions to difficult physics problems, they are unable to demonstrate a basic conceptual understanding of the underlying laws (McDermott 1984). In their own project called SmalLab, Johnson-Glenberg's team was able to get deep involvement as well as sustained learning of basic concepts of physics simply through the use of embodiment and interactivity in a mediated learning environment ("SmalLab: K-12 Embodied and Mediated Learning").

2 Changing Models of Learning

The report of the NSF Task Force on Cyberlearning claims that few of the innovations tried over the ensuing 25 years have resulted in large-scale systemic change in education. Very few schools have progressed beyond the models in place a century ago. Weigel claims (Weigel et al. 2009) that even though students walk into classrooms armed with new competences, learning preferences, and expectations, the over $60 billion that schools have invested in technology over the past twenty years has had little discernible effect on pedagogies or learning outcomes (Christensen et al. 2008). Christensen argues that only disruptive innovation—adopting digital learning wholesale—will change education. Technological capacities have changed; both Christensen and Weigel agree that today's child is introduced to digital media at a relatively young age and spends more time engaging with digital media at critical developmental stages than their older counterparts did. Understanding the deep social and cultural extensions of digital media as used by school children today will enable us to structure better learning experiences for this generation. The following sections present new studies in the field of Digital Media Learning which will serve as guiding principles for understanding how learning happens inside and outside the classroom.

2.1 Peer based learning

Ito and associates, as part of the John D. and Catherine T. MacArthur Foundation Reports on Digital Media and Learning (Ito et al. 2008), highlight the social aspects of social media and its ability to enable peer-based learning. Their report points to two specific ways children use the internet to learn—most youth, they claim, use online networks to extend the friendships that they navigate in the physical environments of
school, religious organizations, and activities like sports and other local activities. These “friendship” networks are “always on,” in constant contact with their friends via texting, instant messaging, mobile phones, and Internet connections.

A smaller number of youth also use the online world to explore interests and find information that goes beyond what they have access to at school or in their local community. Online groups enable youth to connect to peers who share specialized and niche interests of various kinds, whether that is online gaming, creative writing, video editing, or other artistic endeavors. In these “interest” networks, youth may find new peers outside the boundaries of their local community. They can also find opportunities to publicize and distribute their work to online audiences and to gain new forms of visibility and reputation.

In contexts of peer-based learning, adults can still have an important role to play, though it is not a conventionally authoritative one. Unlike instructors in formal educational settings, youth see adults in their “interest networks” as experienced peers, not as people who have authority over them. These adults exert tremendous influence in setting communal norms and what educators might call “learning goals,” though they do not have direct authority over newcomers. Within interest-based groups, there is demand for adult “co-conspirators” who can enable social groups of “geeks” to produce and exchange knowledge on their subjects of interest. Rather than purely “consuming” knowledge produced by authoritative sources, engagement in such environments—both online and offline, in physical space as well as virtual space, involve accessing as well as producing knowledge to contribute to the larger knowledge network.

2.2 The Long Tail

The Long Tail, first proposed by Chris Anderson (Anderson 2006), the editor of Wired magazine, refers to the increasing importance of smaller scale yet highly relevant resources devoured by a select few who are interested in that subject matter. The Long Tail is supported by the ability of digital media to deliver more and more content at less and less cost (Anderson, 2009)—such that the economic limitations imposed on information consisting of atoms (like textbooks) is slowly replaced by information consisting of bytes (like Google or Wikipedia). The printed book, restricted by industrial process of production and economies of scale, dictates that information be generic enough to reach a large population. This model is slowly replaced by digital information, which is nearly free and has the ability to be sourced and consumed based on special interests and specific contexts. This changing model of information sourcing has a large impact on learning and is completely antithetical to the traditional top down model. The Task Force on Cyberlearning calls this model “from mass markets to millions of niches”.

Formal and informal institutions can still have a role to play in this drastically different model of learning. The key is to move from products to experience. Classrooms need to slowly discard models for learning that follow the one-size fits all methodologies while exploring new models of teaching and learning that exploit the Long Tail in real world contexts. Weigel and associates, suggest that educational sites must as a strategy adopt mobile tools such as handheld computers to free students from the classroom context and immerse them in rich, meaningful learning experiences in the real world while maintaining access to text- and graphics-based learning scaffolds. These types of mobile media, or “augmented reality,” provide unique educational affordances, including portability across multiple sites, social interactivity, context-specific engagements, connectivity that can capitalize upon the resources of a network, and a unique experience for each individual learner (Weigel, et al., 2009).
2.3 Consumers are also producers

Shirky’s (Shirky, 2009) studies show that new tools of “social media” create unprecedented opportunities to share, to cooperate with one another, and to take collective action. And very often such actions happen outside of the realm of traditional institutions and organizations—even formal and informal learning environments. Shirky and Anderson both describe the coming together of multiple media into this new social media introduces one differentiating factor in the way information is processed —erstwhile consumers of information are now also producers of information.

Reading from Gee (Gee, 2009) we can see why this shift in balance happens:

1. It is easier today for everyday people not to just consume media but also to produce it themselves. Everyday people—not only experts and elites—can produce personal blogs, professional-looking movies, newscasts, video games, and many other such products.

2. Digital tools are also changing the balance of participation and spectatorship. People are no longer restricted to the role of the spectator. And as participants, they can (and often do) participate in what used to be practices reserved for professional or elite. The ability to produce information and the tools to produce and access sourced information are so readily available that information is never fixed—it is always aggregated and constructed upon. So much so that it is often possible to take a single information source and watch it change over time based on participatory content.

3. Digital tools are changing the nature of groups, social formations, and power. Prior to our current digital tools, it was hard to start and sustain a group. It usually required an institution, with all its attendant bureaucracy and top-down power. Today, with social networking sites like Flicker, MySpace, Facebook, and digital devices like mobile phones, it is easier than ever to form and join groups, even for short-term purposes. Without the requirement of formal structure, groups or what McLuhan (McLuhan, 1964/2003) would call “tribes” can organize themselves bottom up through constant communication and feedback. And new digital access means that “tribes” do not have physical location and can readily form and re-form, transforming themselves as circumstances change.

4. Young people use the Internet and other digital tools outside of school to learn and even become experts in a variety of skills. “Pro-Ams” as defined by Gee are amateurs who have become experts at whatever they have developed a passion for, enabled by the Long Tail phenomenon (Anderson, 2006).

The problem of such constantly changing social networks is that it can sometimes be hard for traditional organizations and formal institutions to keep up the pace of change. The concept of a “tribe” is antithetical to the uniform schooling structure that educational centers practice. Schools have to adapt and come up with strategies to include these systems and exploit them for learning.

2.4 Embodied experience

Before the advent of classroom education, most learning was contextualized by default; the apprentice learned metal-smithing from the journeyman in his workshop, the daughter learned weaving from her mother in or near the home. The classroom model of a shared room equipped with books for learning was a radical departure from the apprentice model of one-to-one learning and onsite knowledge transfer (Weigel, et al., 2009). Gee presents three models of learning in his paper (Gee, 2009); one of them, Situated Cognition Studies argues that thinking is tied to people’s experiences of goal-oriented action in the material and social world. Situated Cognition Studies demands more than the “private mind” of an individual but depends on a world of experience—an experience is almost always shared in social and cultural groups, as the core of human learning, thinking, problem solving, and literacy. Our experiences use all of our five sensory organs as well as thinking and memory. An experience is lived at the moment but it is relived over and over through our narratives and stories. We are able to define other’s experiences through our own perception. We construct our lives on experience; we interact with others on experience; and we interpret our elements through experience.

These viewpoints are important because they allow us to understand experience and specifically embodied experience. But more importantly, they allow for the construction of learning environments which can
create, enhance, or augment experience. For example, an environment can be designed for either corporeal engagement or voyeuristic engagement. Structurally, both systems may have the exact same technological genome. However, in order for a user to make categorical differentiation, the systems must be designed with antithetical experiential constructs. Notions of embodied experience have been explored in architecture as well as technology in considerable depth (Dourish 2004; Harrison, et al. 2007; A. Mathew 2007; McConn 2006).

The work of Moher and others show how embedded technology in classrooms can lead to an incredibly rich and experiential learning environment for science education (Barron et al., 2006; Moher, 2006; Moher et al., 2005). In RoomQuake for example, Moher and his team use the concept of Embedded Phenomenon to enable students to learn about seismic activity through carefully simulated earthquakes in their classroom environment. The same team extends the notion of embodiment to a different concept in a project called RoomBugs (Barron, et al., 2006). On a larger scale, Quest2Learn ("Quest2Learn," ) is a school designed for 6-12 year olds to help bridge old and new literacies. The primary curriculum of the school is based on embodied experience: students engage in "ways of knowing and doing," using models and simulations to study the science of weather, learning mathematical reasoning by designing codes using an Enigma machine, and creating a role-playing games.

3 Just in Place learning

The above trajectories show how new digital media tools and environments are changing learning in and outside of classrooms. One of the most interesting aspects of the changing landscape is that learning happens everywhere. No longer is teaching and learning limited to the boundaries of school buildings. Of course, it can be argued that this has always been the case—but these new tools enable richer and more interesting contexts for learning to happen. Embodied experiences in the real world allow us to engage as well as learn from our physical world. Through immersion, both spatially and culturally, places become aesthetic memories on which situated learning can happen. Our shared corporeity with place makes it an equal participant in a process of learning. It is when we stand in front of a bridge that we are most intrigued by it, and our heads are filled with questions. At this moment, the bridge becomes an incredibly rich learning environment where information is relevant and useful for that one student who stands in front of it—one that has yet to be tapped as a learning resource.

Just in Place learning assumes that information has place and learning happens when information is engaged in place. The phrase is derived from Just in Time information—information that is passed on to a recipient in time to engage the recipient or initiate a behavior change (Intille, 2004; A. P. Mathew, 2005; Singh & Mathew, 2007). Just in Time information makes use of behavioral assets of the recipients—understanding context and action to determine when a particular set of information should be presented. Just in Place learning adds "place" to this interaction—so information is not just presented "when" it is required but also "where" it is required. In short, Just in Place learning removes disembodiment by proposing that informal learning happen in the world we live in, work in, and play in.

Take the city for example—filled with formal and informal learning resources, the city is rich with information. But these resources are hidden behind physical walls of schools, libraries, universities, and museums or held in the heads of formal and informal experts. Social media and new models of learning enable this information to manifest out into the learning environments of students but much of this information is placeless—existing in the cloud and available only by accessing complex search algorithms. Now imagine a scenario in which the whole city is blanketed with a layer of information: information pulled from the myriad sources within the city and layered (virtually) on top of physical structures, natural environments,
3.1 What enables Just in Place learning?

Just in Place learning systems are composed of virtual information layered on top of physical artifacts and made available through different social media outlets/technologies. Such systems are predominantly based on the coming together of ubiquitous and calm computing models (Weiser and Brown 1996), social and immersive media (Shirky, 2009; Snibbe & Raffle, 2009), and situated technologies (Shepard, 2009).

Just in Place learning introduces a new dimension to friendship driven networks and interest driven networks. In short, JPL connects the nodes of these two networks through the context of place. It allows both friendship...
driven networks and interest driven networks to communicate with assets in place—information artifacts in the city that have locational relevance. Because embodiment is a key aspect of the way we experience our world, to be in the context of the happening arouses our sensory perception of events and occurrences. The coming of “broadcast” technology changed this. However today, traditional media artifacts such as photographs, movies, music, audio, and radio are all layered into the complex fabric of the internet and thus becomes available for sharing and reflection. “Broadband” allows for social groups to share such information amongst their peers to be consumed where it happens, even if not when it happens. Thus, information can now be pulled from various sources and consumed and produced asynchronously and/or synchronously in a chosen place and/or time.

In addition, new smart mobile technologies also mean that we now have the ability to retrieve (and expect) just in time, and just in place information. Ubiquitous information in the form of virtual tags on objects in our physical environment is perhaps the most exciting new direction for social media. Using high fidelity geo-location sensors (GPS), directional sensors (compass) as well as orientation sensors (accelerometers), today’s smart phones/devices can be used as simple augmented reality readers to read such virtual tags. The ability to hyperlink physical objects and environmental phenomenon through physical and virtual tags with virtual information will allow users to set up situated points of view, enabling learning about the same object/place/event from multiple points of views.

Any framework is incomplete if it is not applied in the field to design, develop, and test embodied learning implementations. Over the past few years, several projects at the IIT Institute of Design have used the Just in Place learning framework. Since the purpose of this paper is to introduce the Just in Place framework, we will not spend time describing each project. However, a few of these projects are being developed in conjunction with schools in the city of Chicago, and through these projects, we are able to show teachers and school systems how new mobile media allows students to step out from within confined spaces into the outside world where actual phenomenon can be observed, technology can be studied, and scientific principles put into practice. Employing new media applications such as Gypsii and Foursquare show that it is possible to use locative media to engage commentary and exchange of information within friendship based networks. Learning platforms can use the same principles and concepts to extend this to interest networks and learning networks. Locative technologies such as Wikitude, Across Air, Google Maps, Layar, etc. have the power to give us information where we need it and to help us make far-flung juxtapositions with information that we have learned elsewhere. But such connections and abstractions don’t take place all on their own. Teachers and educational institutions have a large role to play in this process. Through careful integration of Just in Place learning into classrooms, teachers, both formal and informal, can facilitate the process of information consumption, production, and reflection. And, they can facilitate better learning environments that make use of the complete urban ecosystem instead being limited to the closed environment of the classroom.

4 Conclusion

In this paper, we looked at four new models of learning that is changing the way we learn in schools and classrooms. Using these models as the premise, the paper proposes a novel framework called Just in Place learning, which uses the urban fabric as a learning environment—taking the knowledge embedded in the classroom out into the places where we live, work, and play.

The framework itself is also a work in progress—each subsequent project informs and transmutes the framework. However, the intention of developing such a framework is that it will serve as a platform for future discussions about embedded technology for learning within the urban environment. It is our hope that this paper and the described framework will allow architects and designers to model new applications and construct innovative experiences for both teachers and students that engage the urban environment.
References

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