Toward Culturally-Aware, Next Generation Learning Ecosystems

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Abstract Next generation learning ecosystems will be comprised of intelligent, adaptive environments that utilize one's cultural footprints to co-create shared narratives and facilitate intercultural understanding. The present paper discusses why digital footprints, cultural signposts, intercultural agents, and transmedia learning are needed to realize relevant learning in virtual environments. The paper introduces notions that may impact the design of culturally-aware information technology for distributed learning are presented.

Keywords Transmedia learning · Ecosystems · Intercultural communication

1 Introduction

Learning today occurs anywhere, anytime. We live in a world that is connected 24/7 and social. Our media habits and expectations regarding technology are changing. We now have the ability to have digital friends, we use multiple screens, and the real world is just one of the platforms we use to interact with content and each other [1]. Learners are telling us how they like to learn, if we listen to them. They are storytellers and builders. They are hands on. They love playing games, and being immersed in a story. They crave technology. They want to create, and leave their mark on the world.

Educators, scientists, and technologists have begun to think about how to deliver and support lifelong learning journeys. Data analytics are used to make games and immersive simulations more adaptive to each learner. Games are designed to help us remember, learn, or make sense of complex ideas. So whether teachable moments come from an immersive game, videos, intelligent tutors, dynamic action data books, or conversations with mentors and peers, scientists are now developing

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intelligent systems that are able to connect experiences that occur in and out of classrooms; and facilitating social learning from peers across the globe [1].

Next generation learning ecosystems will not only leverage technologies such as the ones described above, they will be story-driven, incorporate learning across different media, and allow the learner a variety of entry points into a system of experiences [2]. That is to say, next generation learning ecosystems will support *transmedia learning*. Transmedia learning is as the scalable system of messages that represents a narrative or core experience that unfolds from the use of multiple media, emotionally engaging learners by involving them personally in the story [2]. In order to realize the vision of transmedia learning, blended, multi-media deployment and storytelling strategies need to be leveraged effectively to motivate personalized, self-paced training and education. Media may include serious games, immersive simulations, augmented reality, virtual reality, mixed media environ- ments, intelligent tutoring systems, mobile performance aids, MOOCs, virtual environments, machinima (video or short films made with game technology), mobile learning, graphic novels, motion comics, film, radio, print, user generated content, and social media, to name a few.

For example, consider the following scenario explored in [2]:

A Soldier trains in the field, with different simulators, on different platforms, in the classroom, and with her peers (both co-located and distributed). The use of different media allows her to engage in the training from different platforms and entry points. For instance, if she is learning the art of being a Soldier–Diplomat, she may begin her language and culture training with an intelligent tutor and continue with a single-player scenario on cultural awareness that is delivered via a serious game. She also engages in an alternate reality game on cultural awareness with her peers. Later she blogs about what she learned and shares this information with her team. The conversation about cultural awareness continues on Twitter. She reads about case studies via digital graphic novels or by watching videos available from the MOOC. Her learning is self-paced, collaborative, adaptive, and/or mediated by instructors, virtual mentors [3], and embodied agents [4]. She creates content, tracks her own learning, and monitors her progress. The learning ecosystem tracks her actions as she trains and stores these data in a learning record store, learner profile, or learner model. Her training is delivered via a variety of media, making it more dynamic, accessible, and engrossing.

In addition to story-driven, compelling content, the transmedia learning ecosystem described above will itself need to leverage lessons from digital foot- prints, and incorporate cultural signposts and intercultural agents, especially as part of a complex, techno-social systems of transmedia learning ecosystems. The present paper will discuss why cultural signposts and intercultural agents are needed to facilitate interaction among users or with systems of transmedia learning ecosys- tems. In doing so, the author draws upon excerpts and examples from previous work that continues to be salient in this discussion.

2 Digital Footprints as Cultural Signposts

In his seminal book Silent Language, anthropologist Edward T. Hall indicated that "culture is communication" [5, p. 97] and thus comprised of words, actions, non-verbal behaviors, the handling of time, space, and materials, worldview, beliefs, and attitudes passed over time from generation to generation. Culture is a set of experiences that are deeply rooted in interactions with our physical and social realities, which often go unsaid, but are nevertheless communicated without one's awareness [5]. Our physical environment provides the experiential backdrop in which our interactions over time communicate culture to ourselves, as well as to those around us. According to Hall [5, p. 39], "to interact with the (physical) environment is to be alive… Ultimately everything man does involves interaction with something else." It is through these interactions, and the relevance we place on the feedback we perceive, that culture is formed and expressed to others. The consistent patterns of our interactions with artifacts, our physical environment, and other individuals over time provide cues that others may use to interpret our culture.

For example, as we walk across the lawn during a winter morning, we may hear the crunching of frost under our feet, feel the frozen grass through the soles of our shoes, and see our footprints in newly fallen snow. That is, we usually receive feedback when we interact with our physical environment about how our presence has influenced or changed the physical reality. The feedback makes us more aware of the physical world. The physical environment helps us understand more about ourselves, and therefore more about what it means to be alive. One might say that the physical environment interacts with us, as it registers our actions and provides feedback. To receive that feedback is to receive important information needed to discern cultural phenomena. To receive feedback then is to *feel alive, and feel that the physical environment is alive*.

Similarly, we need to receive feedback from our interactions in virtual, digital, computer-mediated, or electronic settings. We want to know how our actions and presence in a virtual environment influence or change the technology-mediated setting. For example, technology-mediated interactions should help us understand more about ourselves by giving us feedback about what it means to be alive in a virtual setting. When we browse the Internet, we might want to know who else has viewed the same web page, or we may want to see old email messages that fade over time as their saliency diminishes. Hall [5, p. 192] indicates "Experience is something man projects on the outside world as he gains it in its culturally determined form." That is, through communication and feedback from our interactions we learn how to culturally situate our experiences. In order to culturally situate our technology-mediated experiences, we need to sense how our actions impact the virtual setting as we interact with it; we need to be aware of our electronic footprints. Just as in physical settings, we communicate and interpret rich cultural information about ourselves as we interact with artifacts or others in virtual environments.

Researchers and designers of culturally situated, social computing environments need to pay particular attention to the types of cultural footprints we may leave in

technology-mediated interactions and virtual environments. Cultural information in the form of a virtual footprint may include users' current activities, electronic artifacts, narratives, likes, dislikes, assumptions, values, goals, meanings, and history. Whether our interactions are expressed explicitly (awareness of our interactions) or implicitly (being unaware of our interactions), intelligent, adaptive systems have the ability to capture and subsequently communicate the electronic footprints users leave in community-based environments. However, users' electronic footprints are often opaque. Unlike physical environments, most workplace community-based systems today lack these subtle cultural prompts, cues, signposts, or environmental markers that provide us with rich cultural feedback about other users or the environment's current or past state [6]. With the exception of some social media sites, this is one of the reasons why so many community-based systems *do not feel alive, and we do not feel alive interacting in them.*

As our technology-mediated interactions blend real and virtual realities we'll need to balance feedback from our cultural footprints in both digital and physical domains. Which footprints will be left in the real or virtual world? How will our mixed reality learning environments negotiate when and how feedback is to be presented? Lessons learned from face-to-face communication tell us that its quality depends largely on sharing cultural and contextual information [7]. How will a next generation learning ecosystem help us *feel alive* when our attention and footprints are distributed among technology-mediated, virtual, and physical world learning opportunities?

3   Cultural Signposts in Virtual Environments

The author has suggested the need to support technology-mediated communication with intelligent or adaptive virtual environments that incorporate cultural signposts [6, 8, 9]. In particular she has posited that technology alone is not enough to facilitate online and virtual conversations among strangers, even if they shared common interests. We often need a third party introduction to take the first step toward any kind of communication. Additionally, most systems are designed without regard to culture, which could be one reason why spontaneous communication is difficult to achieve in the workplace. Intelligent systems utilizing cultural signposts can be instrumental in instigating informal communication among members, teams, or communities of practice. For that reason she has been a strong advocate for the development of culturally aware information systems [9].

As a guest researcher for British Telecom, the author worked on the development of an adaptive community-based system that incorporated user profile matching, collaborative information storage and retrieval, summarization of shared documents, graphically enhanced audio conferencing, and a dynamic 3D virtual world that automatically moved users with common tasks together in the 3D

environment. For example, software agents inferred a profile for each interest group, based upon the summation of all the subscriptions and profiles. The user's avatar was placed within a notional home area when the system started up, which was calculated by the similarity between a user's profile and the derived profile for each interest group. The focus of a user's work, reflected in the different documents and applications that were being used on a computer, was monitored by the agent-based system. The intelligent agents utilized dynamic user profiles within a community of practice to put people, who would benefit from sharing information in real time, in touch with one another automatically. In this way, the virtual world supported chance encounters and mutual engagement. That is, the virtual world offered users' avatars the ability to 'hang out' online and meet others from one's community of practice through chance encounters.

The goal of the effort described above was to support spontaneous chat interactions [6]. This notion for computer-supported collaborative work was forward-looking for its time. The system had the functionality to technically support spontaneous chat in the virtual setting, by automatically clustering pairs and groups of people together in a virtual world based on their common interests. However, the system wasn't being used to its fullest potential because context, or the reasons why two persons might want to meet, was overlooked. Strangers using the system often had difficulty opening a conversation even though the technical functionality was nearly flawless [6]. The issue wasn't technical—it was social. Nobody wanted to be thrust into a situation where a conversation was expected without having some way to "break the ice." They needed third party help to 'introduce' them, much the way we rely on people at cocktail parties. A redesign was recommended [6] to include user or intercultural agent-generated cultural signposts, or interactive social and environmental cues that could motivate informal communication among strangers in the community of practice. We still need to do a better job of incorporating cultural signposts in our portals, adaptive systems, and distributed learning support technologies to achieve our goal of ubiquitous culturally aware information systems.

4 Intercultural Agents in Intelligent Systems

Intercultural were defined [8] as entities that participate on behalf of users in communication, the exchange of information, and co-creation of meanings by software agents, entities, individuals, or groups. In such instances at least one party perceives a difference among entities, or perceives itself to be different from others [8]. An intercultural agent's goal should be to assist intercultural computer-mediated communication and social computing by managing the awareness of the presence of users' cultural footprints and cultural cues in technology-mediated interactions. For example, intercultural agents may adapt the interface differently

for users with different cultural expectations regarding interface design and visual environment. The author defines cultural cues, or signposts, in agent-based systems as (1) subtle prompts enacted by individual or collections of agents, or the agent-based environment to encourage a user to action, or (2) subtle (symbolic) markers left by agents or humans in an environment that issue feedback about the users' or environment's current or past state. Intercultural agents may have several modes of interaction with interlocutors, or with other agents. First, in an interaction among two or more individuals and software agents, the definition suggests that software agents may assist the user in achieving intercultural communication competence by direct intervention (i.e. with a direct prompt, or interaction with an embodied agent or avatar). For example, an intercultural agent may detect when an inappropriate remark is typed by a user. The intercultural agent could suggest other terms that are less likely to be misinterpreted.

Alternatively, intercultural agents may act on the users' behalf by generating subtle cultural prompts that guide interlocutors to be more aware of their inter-cultural communication competence, or increase their awareness of the saliency of culture in the interaction. Cultural cues, or prompts, may be issued in the form of narratives co-created with users, in the graphical user interface, or through adaptive environments that respond to users' cultural footprints and allow for asynchronous and self-paced exploration. For example, if a newly hired, remote employee is on an organization's intranet to learn about the company, an avatar-guided virtual tour of the physical office space, the team members, and perhaps a frequently asked question section on the formal and informal organizational cultural norms could help the remote employee feel more part of the team [3]. An avatar-guided tour of cultural footprints left in a team gallery of interests might be an informal mecha-nism for obtaining meta-level information on the team culture and individual identities.

In some cases software agents may be working in concert to recognize whether users are operating from different cultural orientations based on learner models, profiles, current context, history, etc. That is, intercultural agents may be privy to user profiles gathered explicitly through feedback to postings in the community-based system that reflect a user's long-term interests; or implicitly through their activities, history, and current context of work. However, agents do not need to overtly communicate this knowledge to users. Instead, intercultural agents may administer subtle, personalized cultural cues (via avatars, icons, etc.) that are salient to one or both parties in the intercultural interaction in order to improve the overall communication competence. In this sense, the software agents (avatars), learning ecosystems, or intelligent user interfaces assist with the process of intercultural communication and serve as part of the intercultural agent com-munity that functions on behalf of users.

5 Embodied Intercultural Agents: Culturally-Aware Avatars

Embodiment is often warranted to facilitate human learning and understanding. Embodied intercultural agents can take advantage of the benefits of human communication, including diversity in the use of verbal and nonverbal modalities and preferences. An avatar is a representation of an entity, such as a company or a single person that interacts with the user and the environment. The choice of an avatar is purposeful—since the avatar influences the impression and impact the organization wants to convey. Avatar choices are often based on four important embodied agent features: the visual appearance, behavior, voice, and interaction between the avatar and the environment [4]. All of these attributes are social markers that influence the social and professional relationships users establish with others through their avatars. Avatars whose behaviors, gestures, and interactions appear genuine increase the perception of humanity associated with the computer interface by building rapport and emotional connections with users. Avatars are ambassadors that represent organizational values and can make the virtual interaction more memorable since they may be given 'personalities' that embody the persona the organization wants to portray [3]. These virtual assistants can answer questions, guide, impart knowledge or advice, perform tasks, and informally interact with the user.

Avatars serving as virtual assistants are "social actors" that train, sell, explain, assist, and guide, etc. Avatars incorporated in learning ecosystems could also be intercultural agents. In particular learning ecosystems would incorporate learner models that represent what and how a given individual learns naturally—by formal and informal learning experiences in and out of the classroom or across learning platforms, simulations, games, and tutoring systems. The socio-technological vision of tracking learning anytime, anywhere, can be understood by considering Distributed Cognition Theory and the notion of "cognition in the wild." Cognition in the wild refers to human cognition as it naturally occurs and adapts in the everyday world—situated in culturally constituted human activity [10]. Platforms for aggregating and managing personal data residing on different desktop applications and Internet services are an active area of computer science research [11]. While making sense of relevant data is also a part of an intercultural agent, the presence of avatars re-creates a life-like relationship by humanizing the computer interface, and bringing an emotional quality to synthetic interactions.

6 Conclusion

As the community-based systems we design bring diverse users together and facilitate their real time communication, collaborative learning, and knowledge sharing, designers need to be more attuned to creating culturally-aware environments that support users' intrinsic motivation for interdependence and participation in a community. We can design intelligent, adaptive environments that utilize

cultural footprints to co-create shared narratives and intercultural understanding among users. We must begin by designing intelligent environments in which users can leave footprints and which provide users with cultural feedback in the form of subtle cues, if we intend to design culturally-aware learning and information technologies for multicultural interactions [8].

We often need to be reminded that technology-mediated human communication and learning occur within *cultural* contexts. Providing a technical opportunity alone is often not enough to support human communication and learning. Humans may need informal social motivators, or cues in the form of cultural signposts, to encourage its adoption and use in organizations. Intercultural agents may help us further organize and understand complex learning environments. As Hall [12] puts it, "Culture is man's medium; there is not one aspect of human life that is not touched and altered by culture." Therefore, the future success of our interactions in intelligent community-based virtual environments, or with next generation learning ecosystems requires that designers not only understand the socio-cultural dynamics that manifest in online communication and in virtual communities of practice, but also that they consider how the design of these environments can support informal communication among strangers and those who are culturally diverse. As virtual assistants and next generation learning ecosystems mature with near human-like capability we will also need to better understand the impact of avatar embodiment and its anthropology on learning—and how these next generation learning ecosystems can help us *feel more alive* in both real and virtual environments.

Next generation learning ecosystems have great potential, however, we have a way to go to realize the creation of learning ecosystems that are equitable and culturally relevant. In order to be culturally relevant, intelligent systems need to be culturally aware and able to represent genuine human experiences [1]. Research in the areas explored by the present paper may assist with the development of learning technologies, transmedia, and next generation learning ecosystems that are ethical and inclusive.

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