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Technologies for Learning from Intercultural Reflections

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ABSTRACT   *This paper explores how technologies can transform the obstacles of geographical and cultural distance into new opportunities for learning and personal growth. In particular, it focuses on the potential benefits of reflection in the context of cross-cultural exchange and how technology can bring those benefits to the classroom. Several instances of research explore the uses of technology for promoting cross-cultural contact as a way to expose students and teachers to fresh models of educational values and practices. A consistent result is that, when people experience a new culture or community or even a new classroom, they report an increase in reflection, both about their identities as new members of the community and about their personal goals and responsibility in relation to the values of the new community. Reflection appears as a deeply social act. Several examples highlight two social functions of reflection in the context of cross-cultural interaction. One important function is to help people decide which aspects of culture to appropriate and how to adapt those aspects to their own interests. Another important function of reflection is to help people become more receptive to the presence of different values and practices. The paper concludes with a set of provisional design principles for encouraging learning through cross-cultural reflection.*

Introduction

When people cross cultural boundaries, for example when a child changes schools or an employee relocates to a foreign office, people begin a process of reflection on their identities, their goals, and their abilities to function. We interviewed 20 adults who lived for sustained periods in foreign cultures (Lin & Schwartz, 2003). They uniformly mentioned the significance and frequency of sincere reflection—reflection on their values, attributions, actions, responsibilities, and their abilities to communicate and learn. One woman who moved from Greece to the US stated:

> The main benefit of living and working in a new culture seems to be related to the fact that you gain experience of something new to the way you have been used to live. You become familiar with a different culture, which can ultimately lead you to make comparisons with your own culture. For me this proves to be a reason to eventually become more aware of your own identity.

Our research explores ways of exploiting this heightened awareness at the crossroads of culture. We use technology-enabled intercultural exchange to improve student and teacher learning.

In this paper, we describe multiple technologies and multiple forms of contact. Our goal is to determine whether we can leverage the reflection borne of cross-cultural contact into an effective catalyst for learning, even when we cannot physically transport people into a foreign culture. In the first section, we clarify how our view of reflection and our goals for cross-cultural contact differ from some common perspectives. In particular, we view reflection as a highly social act rather than solitary problem solving, and we believe reflection yields specific learning outcomes rather than general dispositional changes. Afterwards, as we develop our technology examples, we emphasize two social functions of reflection: "reflective adaptation" for the person doing the reflection, and "reflective receptivity" for the person witnessing reflection. One important function of reflection is to help people decide which elements of a new culture to appropriate and how to adapt them to their interests. Another function of reflection is to make other people more receptive. Given a routine life full of habitual beliefs and cultural supports, people are not always open to reflection. Yet, when people see other people being reflective, it motivates them to consider alternative viewpoints and values themselves. Finally, we conclude with provisional design principles for supporting productive reflection through intercultural exchange.

Reflection as a Social Act

Some Characteristics of Reflection

The reflection we emphasize is a highly social form of thought. It is about oneself in relation to other people and the social fabric. Calderhead (1989), for example, describes reflection "as a process of becoming aware of one's context, of the influence of societal and ideological constraints on previously taken-for-granted practices, and gaining control over the direction of these influences" (p. 44). This social self-reflection rises quickly in cross-cultural immersion. Experiencing the contrast of another way of life leads people to notice and reflect on aspects of their social being that were previously tacit.

Except for institutionally orchestrated reflective periods (e.g. a group therapy session), reflection typically occurs in solitary moments. This solitude is probably more a marker of the intensity and complexity of thought than a marker of individualistic cognition. Crossing cultural boundaries generates challenges to people's identity, practices, and values. They need a respite from the social moment so they can reflect without exposing their vulnerability and without interference from ongoing practices and emotion. When learning to function in a new social setting, people can remain awake at night trying to untangle a day's interactions.

A common Western view of reflection defines it as an abstract form of rational problem solving. A handbook on Western philosophy states:

When thought, however, is bent on solving a problem, on finding out the

meaning of a *perplexing* situation, or reaching a conclusion which is trust-worthy, it is to be distinguished from other types of mental activity. (Columbia Associates in Philosophy, 1923, p. 2)

Similarly, Dewey (1993) characterized reflection in terms of justification and logical reasoning. He wrote that reflection involves the "active, persistent and careful consideration of any belief or supposed form of knowledge in light of the grounds that support it and the further conclusions to which it tends" (p. 9).

The characterization of reflection as careful problem solving seems too circum-scribed to capture the phenomenon we are after. It does not do justice to the full range of mental activities people use to make sense of their situation. People, for example, can spend considerable time constructing models of a culture to determine whether they made a "faux pas" earlier in the day. Moreover, scholars from other cultures provide different characterizations of reflection. Confucius stated:

Self-reflection enhances your ability to conquer your own conflicts and weaknesses. It is the most important means to achieve a balanced mind within oneself. A balanced individual usually knows one's position in the community, is patient, is well-mannered, and respects others as well. (Li, 1996, p. 180)

For Confucius, reflection is not reserved for problem solving, and the methods of reflection do not depend on deductive justification. Reflection, for example, can occur through artistic expression. In Confucius' view, reflection is a slow and habitual path to long-term harmony and enlightenment. Whereas some Western scholars characterize reflection by its problem-solving process, we appreciate Confu-cius' view which characterizes reflection by its social content. People can complete abstract problem solving about their car repair. But when it comes to the emotion-ally laden challenge of determining which cultural values and practices to adapt, people reflect for days, weeks, and months. One reason that we think cross-cultural reflection can be valuable for education is that it can deeply engage people in the process of grappling with new models of educational practice.

Outcomes of Cross-Cultural Contact and Reflection for Specific Learning Outcomes

Our goals for reflection and cross-cultural contact are unique in two important ways. With respect to reflection, our goal is to target specific practices relevant to education and learning. With respect to cross-cultural contact, our goal is to promote reflection on those educational practices.

For many, including Dewey and Confucius, the reason for arranging reflective experiences is to develop a person's reflective disposition. The assumption is that reflective experiences teach people to be more reflective in the future. Though laudable, 50 years of psychological research has shown that it is very hard to teach people general skills like logical thinking, planning, and problem solving, at least within the time frame available to most classes (Nisbett *et al.*, 1993). People incline to local knowledge over general skills.

Our goal is less ambitious. We use reflective experiences to help people learn about specific educational practices. For example, by exposing teachers to new educational practices, teachers can reflect on those practices *vis-à-vis* their own. In one study, for example, we asked teachers and students from China and America, in both public and private schools (key schools in China), to design their ideal student (Lin & Schwartz, 2003). In most cases, the students and teachers emphasized learning traits. For example, when we subsequently asked what would happen if their ideal students failed to do homework, the teachers and students tended to say they would not learn. In one American public school, however, the students and teachers tended to emphasize good behavior over learning. So, for example, when asked about the consequences of missing a homework assignment, the students and teachers said the ideal student would get punished. When we showed the American teachers these results, they were very alarmed. They were unaware that they had been complicit in creating a classroom culture that valued discipline over learning. This led the teachers to a productive period of reflection on their own goals and methods, and about the practices that must be occurring in the other schools where children's ideal student centered on learning. Our goal was not to have these teachers become generally reflective. Instead, our goal was to help the teachers reflect on a specific set of educational practices, namely, their classroom management practices.

Cross-cultural Contact for Promoting Reflection on Differences

Perhaps the most dominant perspective on the desired outcomes of intercultural exchange comes from social psychology. After World War II, influential scholars developed the "contact hypothesis", which stated that the reduction of prejudice occurs through social contact (Hewstone & Brown, 1986). This hypothesis has yielded mixed results. Although, contact may be necessary for the reduction of prejudice, it is insufficient. Without a delicate organization of factors, contact can increase prejudice instead of reducing it (Pettigrew, 1986).

In simple form, the hypothesis proposes that social contact enables people to recognize the similarities that run beneath their cultural differences. This recognition should in turn have the more distal consequence of reducing prejudice (Hewstone & Brown, 1986). Our approach is different. First, we rely on differences rather than similarities. Another culture provides a contrasting case that can help people notice what was previously imperceptible (Bransford & Schwartz, 1999). Just as tasting wines side-by-side can help people notice new flavors that make the wines distinctive, putting cultures in contrast can help reveal practices and assumptions that differentiate the two. This helps people see alternative possibilities for actions and values.

Secondly, instead of looking at how contact might lead to a hoped for distal consequence (i.e. prejudice reduction), we begin with a proximal outcome of contact that is fairly guaranteed, namely reflection. A Japanese scholar, Naomi Miyake, recently told us the story of how her college students had created a questionnaire to explore women's attitudes towards retaining jobs. The students

asked questions like, "Will you leave the job once you get married?" "Will you keep the job to help with household finances?" At Dr Miyake's insistence, the students included a last item called, "Other?" The Japanese students sent their questionnaire to some American women. The American's frequently chose "Other?" and wrote, "I would leave a job once I got bored." The Japanese students were astounded. At first the students thought the Americans were playing a rude joke. After a while, some students began to consider the nature of a culture that could support this kind of rudeness. Other students began to accept this as genuine response and pondered their own assumptions about the nature of gender and work. Notice that, regardless of whether the students generated the prejudicial interpretation (rude behavior) or the non-prejudicial interpretation (different but viable cultural values towards work), the Japanese students entered a period of reflection. Reflection is the proximal outcome of intercultural exchange, and we are trying to find ways to help this common fact do educational work.

Technology and Intercultural Reflection

Cross-cultural experiences generate excellent opportunities for reflection and learning. In addition to alternative models of practice, they provide contrasts that help people notice aspects of their own practice. It is important, however, to avoid the simplification that any cultural exposure leads to productive reflection. One American who lived as a Peace Corp volunteer in Ghana noted, "For some Americans, living in Africa was too much of a shock. I saw this happen. These Americans dismissed differences as pointing to others' inferiority. This kept them from learning about themselves." Moreover, culture can be a crushing force. Rousseau, whose *Social Contract* so influenced constitutional democracies, is also a father of existentialism. In *Reveries of the Solitary Walker*, he describes how his culture rejected his uniqueness, and he was left to bitter reflections trying to rationalize a life without acceptance.

When we orchestrate cross-cultural exchanges, we should protect our students and provide ways that they can adapt rather than simply submit, reject, or flounder. Technology can be a powerful ally. Not only does it enable cross-cultural exchanges, it allows people to meet new cultures in bite-sized pieces that target specific opportunities for reflection and subsequent changes to practice. Our approach has been to use technology so individuals can interact with another culture while remaining in their own. This protects them from the full force of another culture, and it encourages them to adapt their cross-cultural lessons into the life they have to lead right then and there.

Reflective Adaptation

Cultures meet through material artifacts. Typically, when educators speak of technology facilitating cultural exchange, they mention communication technologies that enable people to talk or watch video (e.g. Stigler & Heibert, 1999). However, technological artifacts themselves can serve as the "culture" that gets exchanged.

For example, one of us had the opportunity to live for several years in a small Native Alaskan village too remote to receive radio broadcasts or phone connections. During that time, they received a downlink from a television station provided by the state. The assumption was that the television programs would deliver important information about the outside world. The children, however, noted a different outcome. As one boy complained, "Nobody ever walks around anymore. They just sit home and watch the stupid TV." Anthropologists and cultural historians have documented the power of material artifacts in precipitating change (Pelto & Muller-Wille, 1987). Surprisingly, there are few studies that examine this process in the context of classrooms. This seems like an important topic as we increasingly introduce technology into schools (e.g. Schofield, 1995).

Artifacts often embody cultural values and practices. If these values are in contrast to a receiving culture, they may precipitate a process of reflection. In one study, we documented how a 5th-grade Hong Kong teacher responded to the introduction of an educational artifact from the US (Lin, in press). After observing the teacher during a week of "routine" instruction, we asked her to spend a week using *The Adventures of Jasper Woodbury*, a video-based narrative that embodies American ideals about learning math in realistically complex, problem-solving contexts (Cognition and Technology Group at Vanderbilt, 1997). We interviewed the teacher and a sample of students throughout the process, and we observed the daily lesson structure.
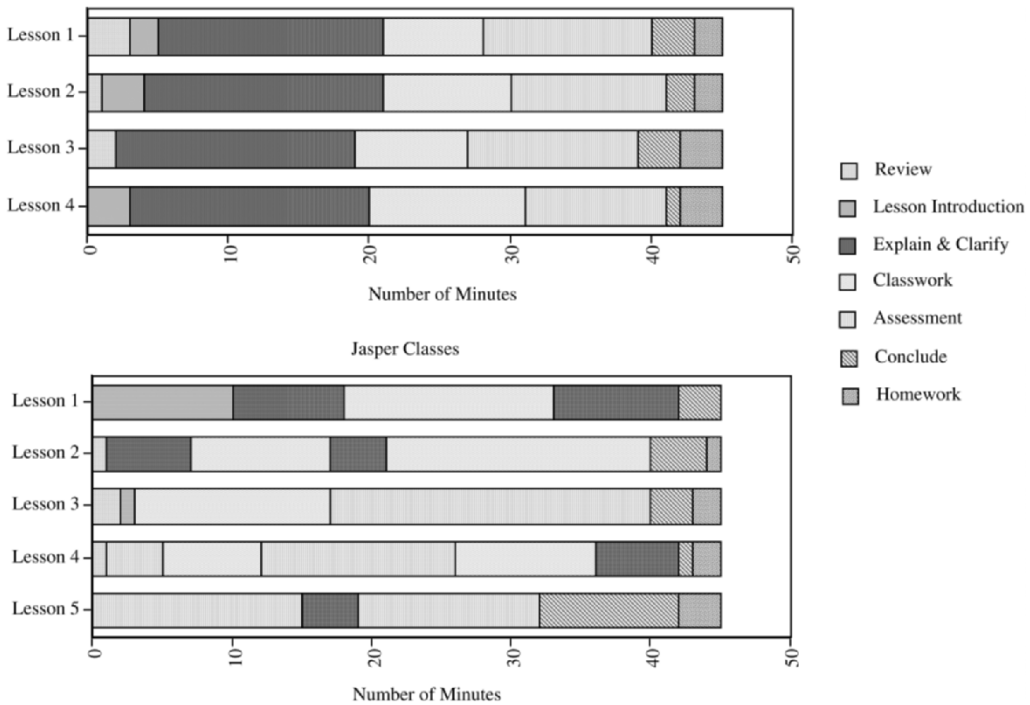

FIG. 1. The routine structure of the Hong Kong teacher's lessons disappeared as she struggled to adapt an educational artifact from the US into her classroom (Lin, in press).

Figure 1 shows the daily instructional sequences for four routine lessons and five *Jasper* lessons. The flow of the instruction was uniform for the routine lessons. When *Jasper* was introduced, the structure of the lessons shifted and became unpredictable from day to day. The artifact afforded different patterns of interaction and disrupted the previously regimented classroom. The students seized on the open-ended structure of *Jasper*. They began to reject the teacher's attempts to follow the normal routine of an initial example followed by practice exercises and then assessment. Moreover, because a *Jasper Adventure* is complex, it typically takes a team effort. These students, who typically had not worked collaboratively, began to find they were extremely competitive. This raised a host of challenges for the teacher and students to establish a new community of practice.

Interviews revealed that the challenges to the teacher's ability to sustain her regular classroom structure caused her to reflect deeply on her identity as a teacher, her assumptions about the functions of classroom education, and her practice. She worried that letting the students pursue their problem-solving inclinations would erode her authority, and she wondered whether letting students work together without her control meant she was no longer teaching. Ultimately, she made a series of justified decisions to adapt some of the affordances of *Jasper* and reject others. She adapted her role as teacher by providing lessons on a need-to-know basis instead of using pre-instruction at the start of each lesson. She let go of her desire to perform assessments at the end of each day (perhaps not a good thing), and she rejected allowing students to work through the problem at an independent pace.

The level of reflection was intense for the teacher as she began the transition from routine expertise to adaptive expertise (Hatano & Inagaki,1986). In a process we label "reflective adaptation", she had to make decisions about whether to change her practices in response to the artifact and what those changes would mean for her identity. Unlike watching a videotape of a classroom from another culture, the teacher could not treat this as an academic exercise in reflection. And unlike entering a new culture, she could not simply rely on the prevailing culture to determine the course of behavior. The level of responsibility was high as were the opportunities for agency—an ideal mix for productive reflection and adaptation.

Instructional technologies for reflective adaptation.   Encouraging reflection via new technologies, like *Jasper*, can be powerful. But it can fail. One problem is that people may not be receptive to reflecting on new values or practices. The Hong Kong teacher was particularly receptive to *Jasper* because she was in a school that was searching for ways to improve its standing in the community. Other Hong Kong schools rejected our overtures to introduce *Jasper*. Another problem is that many artifacts under-specify their use. In the movie, *The Gods Must Be Crazy*, a soda bottle becomes a club. Although under-specification provides room for reflective adaptation, it can be a liability. Studies within the US show that without guidance teachers sometimes use *Jasper* in a way that disregards its affordances for reform-based instruction. The artifact gets assimilated into the existing culture without affecting traditional teaching methods. One way to address this challenge is to
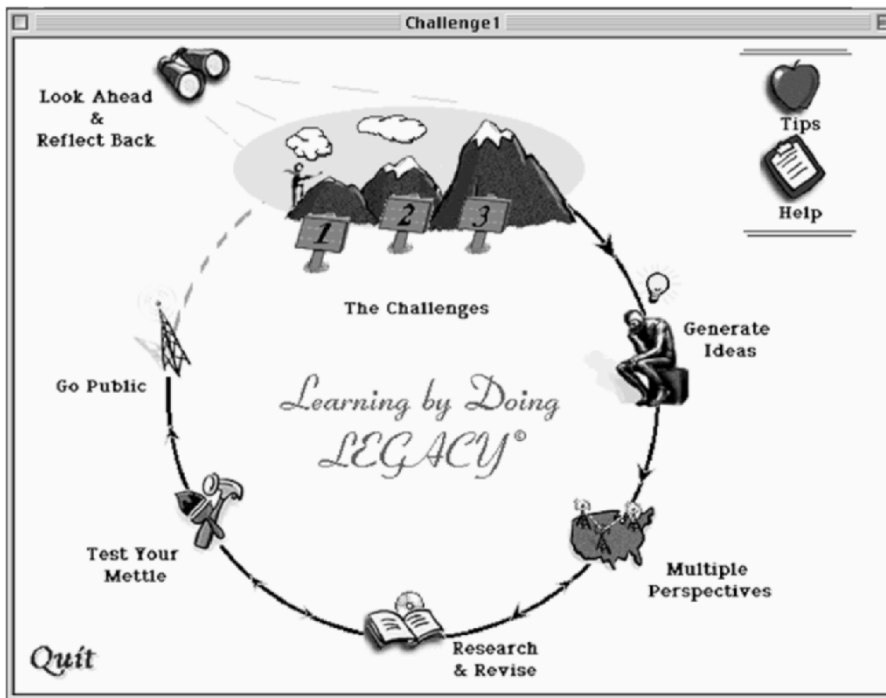
FIG. 2. STAR.Legacy is a multimedia shell the helps students and teachers reflect on inquiry-based lessons while adding their own content to adapt them to their specific context (Schwartz *et al.*, 1999a).

provide examples of practice to complement the technology. This is tricky, because we want to provide guidance, but we do not want to imply this is the only way to use the artifact, which would undermine reflective adaptation.

In our designs of instructional technology, we try to encourage reflective adaptation. We offer teachers and students the responsibility and agency for adapting technologies to their needs. And, we try to build sufficient guidance into the artifact so they see its educational affordances. We originally called this flexibly adaptive instructional design (Schwartz *et al.*, 1999a), but it might better be called *reflectively* adaptive instructional design.

As one example, we created STAR.Legacy (Schwartz *et al.*, 1999b). Legacy is a multimedia shell that embodies a set of practices for managing complex problem-, project-, and case-based activities. Figure 2 shows the software interface which suggests a sequence of events that are valuable for inquiry-based instruction. People click on the different icons to reach "pages" that hold relevant activities. Clicking on a Challenge icon brings students to a page that presents a problem or case they need to learn to solve. Generate Ideas takes students to where they generate their initial thoughts about the problem. Multiple Perspectives leads to a page that holds video clips of experts offering their insights on the challenge. These perspectives typically offer contrasts between themselves and the students' initial ideas. This helps students reflect on their own views. The remaining icons branch to resources for

working on the problem, for self-assessing and revising, and for publicly presenting solutions.

Legacy offers practices, without overly prescribing the curriculum or sequence of activities. For any given instance of Legacy, there are activities and resources that we, as instructional designers, seed into the program. For example, in the domain of educational psychology, we populate Legacy with challenges and resources (e.g. anchor videos, expert commentary, articles, web-links, self-assessment activities) for learning how to teach with hands-on materials. Similarly, in the domain of the life sciences for middle school, we present three progressive challenges for understanding how exotic flora and fauna can affect an ecosystem. Yet, Legacy is designed so students and teachers can add further content to adapt it to their local communities. For example, students can interview gardeners about plants and insects. They can include these as resources, leaving a "legacy" for future generations of students. Similarly, teachers can incorporate new content that maps into local curriculum standards. After supplementing a Legacy, the teacher can press Legacy CDs for the students and for use in subsequent classes.

Ultimately, our goal is to have teachers and students reflect on what is important to learn and to capitalize on the strengths and needs of their local community. This differs from many models of instructional design that expect teachers to comply with practices determined by remote instructional designers. In this latter case, there is little opportunity for reflective adaptation and growth for the teacher.

Reflective Receptivity

When immersed in another culture, people face many personal challenges that cause them to reflect. When we use technology to connect people who remain in their base culture, there is less pressure to be reflective. We have been considering ways to use technology to make people more receptive.

Humanizing culture.   One of our approaches has been to "humanize culture". Instead of presenting anonymous practices by videotape or artifact, we help people understand why individuals use those practices and artifacts. This humanizing, in turn, makes students and teachers more receptive to the values behind the practices and artifacts and leads to productive reflection. Our effort began with a growing concern about a serious disconnect between foreign professors and their American students. To explore possible solutions, we examined whether humanizing a foreign professor would change college students' perceptions and inferences.

The participants began with a written case about Professor X from China and her difficulties with American college students. They answered a number of questions about their perceptions of the problem, and they proposed solutions. Following the baseline exercise, we divided the students into two groups that saw one of two videos. In one group, the participants saw a "tourist" video that described the history, famous places, foods, and rituals of the professor's culture. In the other group, the participants saw a video about the social and personal challenges

Professor X faced when coming to America as a child. Afterwards, everyone answered the original questions about the case a second time.

Prior to the videotapes, most of the participants saw the problem as a result of Professor X and her unrealistic expectations. Afterwards, those students who watched the tour video did not change their perceptions or solutions. They tended to offer stereotypical thinking: "The professor is a typical Chinese who is rigid, critical and boring." "Like most Chinese, she is hard-working and values education, but is boring and strict and has few social skills."

Those students who watched the personal video altered their thinking substantially. They were more understanding and brought the issue of Professor X's cultural experiences into their thinking. For example, one student wrote: "The professor realizes what life can be like without education because of the personal cultural experiences. She is a responsible professor, values education and wants to provide her students with a good education … ." Those students who had the resources to "humanize" Professor X were more understanding of her educational practices. Although we did not test the students further, we suppose that the "people knowledge" could help them reflect on their own beliefs and practices in regard to foreign teachers.

At one level, this result makes intuitive sense and is supported by research on the benefits of personalizing cultural exposure (Hewstone, 1996); getting to know someone as an individual makes it harder to stereotype that individual. At another level, the finding significantly reinforces the value of integrating technology into the culture and reflection mix. Rather than being cold and depersonalizing, technology can be a catalyst to humanistic compassion.

Reflection as a Way of Humanizing Oneself for Others

At heart, reflection is a form of self-assessment. It is an attempt to re-evaluate one's actions and beliefs in light of the community in which one operates. Within schools, it is a good idea to encourage students to self-assess, rather than leaving all assessment up to teachers. If nothing else, it engages students to think about their work more carefully. Self-assessment, however, can be difficult. Like the American public school teachers who did not realize they had been emphasizing behavior over learning, it is hard to know what to assess or to make assessments that go much beyond one's initial understanding.

To promote student self-assessments of their work, as well as more profound reflection about themselves as learners, we have been asking students from different cultures to assess one another's homework with the help of the Internet. One of the striking outcomes of this work is that when people see evidence of other people being reflective, they become more receptive to those people and reflective themselves. This is one reason why we characterize reflection as a social act. Not only does it have social content for those who do the initial reflection, it also serves the social function of making other people more receptive.

In our exploration of cross-cultural peer feedback, we originally asked middle school students from Hong Kong to assess the homework of their counterparts in

America. The homework was to write a story about a historical period of China. We quickly learned that this arrangement caused misunderstanding. From the Hong Kong students' perspective, they felt that they should be as critical as possible, so the American students could learn more. The American students, however, felt that the Hong Kong students' feedback was "too harsh", and they had little desire to revise their work in response. To resolve this problem, we did not prescribe strategies for giving and receiving feedback, because we knew our rules could not cover all the possible misunderstandings that might arise. Instead, we tried to humanize the activity, so the students would naturally become more receptive to one another's values.

To humanize the exchange, we asked the American students to self-assess how well they had created stories that "had main ideas", "were interesting", and "were accurate". They also wrote of any difficulties in doing the assignment. Our thought was that including the US students' self-assessments and reflections would cause the Hong Kong students to comment on the essays with respect to the students who produced them. They would become receptive to the needs of the American students, and this would cause them to be more reflective about their role *vis-à-vis* the students.

Half of the Hong Kong students read the stories plus self-assessments and the other half only read the stories. The Hong Kong students worked in groups to provide written feedback to the US students. The Hong Kong students who did not see the self-assessments were uniformly critical in their feedback. The Hong Kong students who received the self-assessments were equally critical about the content generated by American students, but were more positive and encouraging in the tone of their feedback. For example, one group of Hong Kong students wrote in their feedback,

> … your story was not very deep and complex. You should also write about life of upper class people of the time rather than only about lower class people because you need to provide a complete picture of the life in that time … However, from your self-assessment, we felt that you are willing to look into yourself for improvement and you are quite thorough about it. Overall, you guys seem to be good people.

The submissions that included self-assessments elicited friendlier and more specific feedback about possible improvements. Interview data showed that American students who had sent their self-assessments, and therefore received the more receptive feedback, felt more of a bond with the Hong Kong students and indicated more willingness to continue to work with them. The self-assessors were more open to Hong Kong students' evaluations of their products and tended to view the requests for revisions positively, rather than as a sign of failure. They also began to reflect on themselves as learners relative to the values exhibited in the Hong Kong feedback. Based on subsequent interviews, we found that they noticed important learner characteristics exemplified by the Hong Kong students, including clear and logical explanations, and a serious attitude towards schoolwork. They also found that the

Hong Kong students' English grammar was so-so, which might open an avenue for reciprocity.

Overall, we found that signs of reflection and self-assessment in others made members of both cultures more receptive to thinking about one another's beliefs, practices, and productions. Reflection is valued across many cultures, and seeing people reflect causes us to be more understanding, receptive, and ultimately more reflective.

Conclusion

Summary

The goal of this paper has been to initiate a discussion on the potential benefits and conditions of productive reflection in the context of cross-cultural exchange and to use technology to bring those benefits to the classroom. Much of our research has explored the use of technology for promoting cross-cultural contact as a way of exposing students and teachers to fresh models of educational values and practices, and as a way of illuminating their own. For example, we find that when people move to a new culture or community or even a new classroom, they report an increase in reflection about their identities, their personal goals, and their responsibilities in relation to the values of the old and new communities. In this context, the value of reflection is to help people learn a specific body of knowledge about themselves and the cultural basis for their beliefs. Ideally, this knowledge can guide their future learning.

An important function of reflection is to help people decide which aspects of a new culture to appropriate and how to adapt those aspects to their own interests. For reflection to take place, people have to notice and be receptive to other points of view and activities. To achieve reflective adaptation and receptivity, we believe that students and teachers need to take on responsible roles that require authentic decision making. Being a tourist is not always sufficient to make people either receptive or sincerely reflective. To move towards these goals, we have used technology. Technology enables manageable cross-cultural exchanges that target specific learning goals for reflection. At the same time, the technology allows people to interact with a foreign culture while maintaining responsibility to their local culture.

Design Principles for Fostering Productive Reflection

We have been working towards a few principles that can help design productive environments for reflective learning through cross-cultural exchange. There are many possible principles. Here we only highlight those principles from the preceding discussion.

(1) Create reflective activities that target educational goals.
(2) Include opportunities for responsible action that motivate genuine reflection.

(3) Present culture in bite-sized pieces that help focus reflection and are sufficiently manageable that individuals can affect changes based on their reflections.
(4) Permit solitary moments for social reflection.
(5) Design technology that suggests practices but encourages adaptation.
(6) Humanize cultural contact so people will be receptive to reflection.

We conclude with a recent Internet intervention that highlights the six design principles. We asked a teacher in Hong Kong, "Sally", and a teacher in the US, "Cindy", to teach a group of students a biology lesson. The teachers never met each other or their students face-to-face. Instead, they conducted class in a web-based, virtual reality in which they appeared to one another as avatars and communicated in real-time by typing. Figure 3 provides a summary of the activities the teachers completed, and it provides a glimpse of the virtual learning space (VLS) that we built in Active Worlds.

To foster reflective activities that target learning goals (Principle 1), we created an experiment on insect habitats in the VLS. By co-planning and co-teaching around the experiment, we hoped the cross-cultural interactions would help the teachers increase their content knowledge, pedagogical skills, and appreciation of different learning goals.

To enhance authentic responsibility (Principle 2), teachers had to teach real children in real time (as opposed to exchanging personal teaching videos, as is frequent in cross-cultural professional development initiatives). By putting teachers in authentic teaching situations, they had to make consequential decisions whether to change their normal practices in response to the VLS and one another and what those changes would mean to themselves and their students.

To permit changes in practice as a result of the cultural contact, the teachers interacted with another culture while remaining in their own (Principle 3). This protected teachers from the full force of another culture and allowed them to adapt their cross-cultural peer's values and practices reflectively into their teaching.

To allow solitary moments for social reflection (Principle 4), we asked teachers to jointly plan their lesson using e-mails before they started teaching. The solitary opportunities to reflect on what they would say in their e-mails gave the teachers a chance to consider and craft their thoughts. During the e-mail planning, they spontaneously wrote what was important to each of them and how to compromise in areas that they disagreed. This reflection allowed both teachers to learn about one another's strengths and their own weaknesses. Cindy e-mailed to the Hong Kong teacher, "I am so impressed with you! You have such a command of the science experiment design that I think you ought to be teacher A, who teaches content and I can be teacher B (the social one) and whisper with you and encourage talk among the students. Fondly, Cindy." Meanwhile, Sally learned about Cindy's talents for creating a warm and supportive social atmosphere for student learning. These early exchanges were important once the teachers actually met the students and had to make on the spot decisions. For example, when they were having some trouble controlling the students, Sally asked Cindy to take charge, but when a question arose about the experimental logic, Cindy asked Sally to take over.
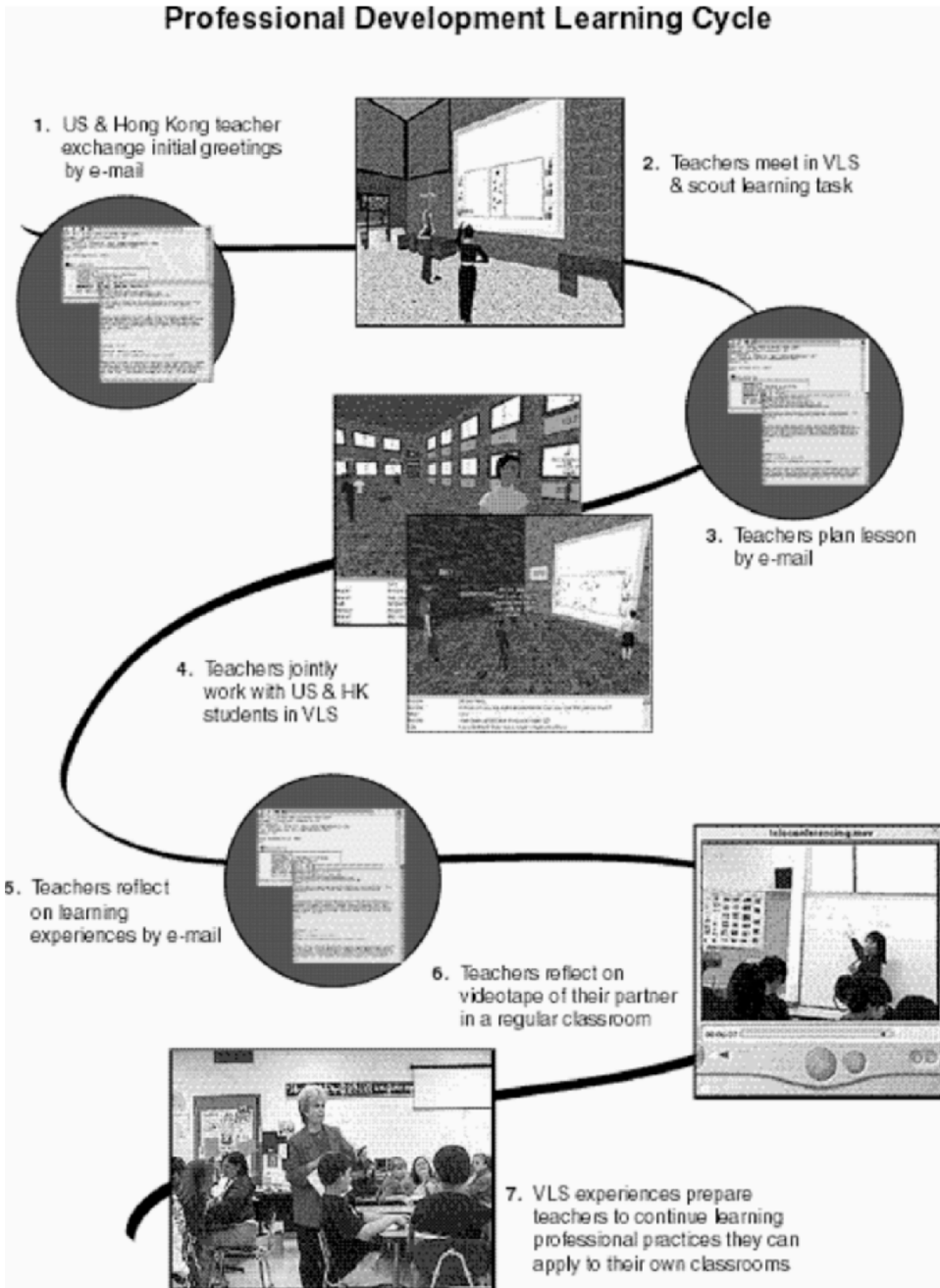
FIG. 3. Teachers from the US and Hong Kong met in a three-dimensional virtual world to teach students on-line (Lin & Schwartz, 2003).

To design technology that suggests practices but encourages adaptation (Principle 5), we designed a web-based experiment on insect habitats that highlighted variable control. This afforded specific practices for the students and teachers. At the same

time, we intentionally under-specified the goal of the lesson. We simply told them to teach the students what they thought the students should learn. This invited each teacher to project and revise her own goals.

To humanize the cultural contact (Principle 6), the teachers exchanged e-mails to prepare their lesson. The multiple exchanges helped each teacher reflect on the human values behind the other teacher's instructional preferences. These interactions led to the formation of personal bonds as revealed by the content and frequency of their e-mails (19 e-mails during the week of planning, and three per week for six months after).

By our account, the VLS experience should have influenced the teacher's receptiveness to one another's knowledge and practice. To examine this hypothesis, we collected videotapes of Sally and Cindy working in their regular classroom. We asked uninvolved (non-VLS) teachers to observe the videotapes and notice any valuable lessons for themselves, just as they might do in a cross-cultural professional development setting. These control teachers tended to dismiss any novel practices they noticed. For example, the control teachers from the US claimed that the high structure and intellectual discipline of the Chinese teacher's classroom could never be accomplished in America. In contrast, the VLS teachers did not relegate the differences they saw in the videotape to "culture", and they considered ways to adapt some of the shown practices and values into their own culture. For example, the US teacher saw the strictness of the Chinese teacher, and this caused her to reflect on whether she had allowed her expectations and standards to sink too low.

Ultimately, we shall need more work to explain the forms of knowledge that emerge at the crossroads of culture with the support of technology. And we need more understanding of how to use technology as a catalyst to reflection. Ideally, we shall form design principles so technologies can transform the obstacles of geographical and cultural distance into new opportunities for learning and personal growth.

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Acknowledgements

References

BRANSFORD, J.D. & SCHWARTZ, D.L. (1999) Rethinking transfer: A simple proposal with multiple implications. In: IRAN-NEJAD, A. & PEARSON, P.D. (Eds) *Review of Research in Education*, 24, pp. 61–101.

CALDERHEAD, J. (1989). Reflective teaching and teacher education. *Teaching & Teacher Education*, 5(1), pp. 43–51.

COGNITION AND TECHNOLOGY GROUP AT VANDERBILT (1997) *The Jasper Project: Lessons in curriculum, instruction, assessment, and professional development.* Mahwah, NJ. Lawrence Erlbaum Associates.

COLUMBIA ASSOCIATES IN PHILOSOPHY (1923) *An Introduction to Reflective Thinking.* New York: Houghton Mifflin.

DEWEY, J. (1933) *How We Think.* Boston: Heath.

HATANO, G. & INAGAKI, K. (1986). Two courses of expertise. In: Stevenson, H.A.H. & Hakuta, K. (Ed.), *Child Development and Education in Japan*, pp. 262–272. New York: Freeman.

HEWSTONE, M. (1996) Contact and categorization: social psychological interventions to change intergroup relations. In: MACRAE, C.N., STANGOR, C. & HEWSTONE, M. (Eds.), *Stereotypes and Stereotyping.* New York: Guilford, pp. 323–368.

HEWSTONE, M. & BROWN, R. (1986) Contact is not enough: an intergroup perspective on the 'Contact Hypothesis'. In: HEWSTONE, M. & BROWN, R.J. (Eds) *Contact and Conflict in Intergroup Encounters*, pp. 1–44. Oxford: Blackwell.

LI, D.Y. (1996) *The Wisdom and Philosophy of Confucius.* SiZuan, China, Educational Publisher.

LIN, X.D. (2002) Reflective adaptation of a technology artifact: a case study of classroom change. *Cognition & Instruction*, 19(4), 395–440.

LIN, X.D. & SCHWARTZ, D.L. (2003) Reflection at the crossroads of culture. *Mind, Culture, and Activity*, 10, pp. 9–26.

NISBETT, R.E., FONG, G.T., LEHMAN, D.R. & CHENG, P.W. (1993) Teaching reasoning. In: Nisbett, R.E. (Ed.) *Rules for Reasoning*, pp. 297–314. Hillsdale, NJ: Erlbaum.

PELTO, P.J. & MULLER-WILLE, L. (1987) Snowmobiles: Technological revolution in the Arctic. In: BERNARD, H.R. & PELTO, P.J. (Eds) *Technology and Social Change*, pp. 207–258. Prospect Heights, IL. Waveland Press.

PETTIGREW, T.F. (1986) The intergroup contact hypothesis reconsidered. In: HEWSTONE, M. & BROWN, R.J. (Eds) *Contact and Conflict in Intergroup Encounters*, pp. 169–195. Oxford: Blackwell.

SCHOFIELD, J.W. (1995) *Computers and Classroom Culture.* Cambridge: Cambridge Press.

SCHWARTZ. D.L., BROPHY, S., LIN, X.D. & BRANSFORD, J.D. (1999a) Software for managing complex learning: Examples from an educational psychology course. *Educational Technology Research & Development*, 47, pp. 39–59.

SCHWARTZ, D., LIN, X.D., BROPHY, S. & BRANSFORD, J.D. (1999b) Toward the development of flexibly adaptive instructional designs. In: REIGELUTH, C.M. (Eds) *Instructional Design Theories and Models: a new paradigm of instructional theory*, pp. 183–214. Mahwah, NJ: Erlbaum.

STIGLER, J. & HIEBERT, J. (1999) *The Teaching Gap: best ideas from the world's teachers for improving education in the classroom.* New York: Free Press.