

# Exploring Globally Inclusive Online Collaboration for Indian and Finnish Schoolchildren

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Figure 1: (From left to right) a child in Tesomajärvi school, Finland, a child at Deepalaya, India, a tourist's view of the CityCompass application, and a guide's view of the application.

## ABSTRACT

We present our exploratory work on globally inclusive online collaboration for schoolchildren in India and Finland, using CityCompass, an online virtual navigational application for conversational language learning. User studies with Indian children, who collaborated with a Finnish researcher, showed several barriers towards communication and collaboration, including issues from limited access to computers and gaming to socio-cultural effects of a large power distance and face-saving. By adding a dramatized scenario, the *Bollywood Method*, these barriers were reduced. Next, we replicated the study with Finnish children, who collaborated with an Indian researcher. Here, previous computer and gaming experience reduced the motivation towards communication. In this paper, we present studies conducted in Finland, compare it with the Indian ones, and discuss opportunities for inclusive collaboration between Indian and Finnish children. Overall, our findings indicate that online collaboration is affected by differences in computer skills, video gaming experience, and socio-cultural communication norms.

## CCS CONCEPTS

- **Human-centered computing** → **User studies**
- Human-centered computing → Empirical studies in HCI

## KEYWORDS

Inclusive learning; Interaction design; Cross-cultural collaboration; Collaborative online applications; HCI4D

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## INTRODUCTION

Online collaborative environments are becoming increasingly popular, and cross-cultural communication and collaboration are considered important 21st century life and career skills [29]. Cross-cultural collaborative experiences “not only expand students’ view of multiculturalism, but also enhance the concept of self and cross-cultural communication and collaboration competence” ([2], [32]). Furthermore, we should emphasize inclusion and inclusive learning with Human-Computer Interaction for Development (HCI4D), where currently underserved children are provided access to technology and a way to connect to their global peers. However, designing for cross-cultural online collaboration requires an understanding of the differences in social and technical interaction between those cultures.

We present our research on designing culturally comfortable interactions for globally inclusive collaboration

([11], [12], [26]). We started by studying two uniquely different cultures, Indian and Finnish. Schoolchildren in both countries used CityCompass, an application for collaborative language learning using wayfinding tasks, with a researcher from the other country, and communicated in English. Both Indian and Finnish children usually learn English as a second language in schools. In India, English is seen as an important skill for employability and improving socio-economic status; a key for success [4]. In Finland, English is considered a key to globalization in business and science, and it is the *lingua franca* for online and TV media, as well as rock and pop music [28].

Being the first research study of its kind involving Indian and Finnish children for collaborative tasks, we started with child-researcher pairs rather than child-child to understand the challenges that arise and to avoid negative experiences or misunderstandings among the children. Children from the Deepalaya Learning Center Sanjay Colony in New Delhi, India, collaborated with a Finnish researcher [26], and children from the Tesomajärvi school in Tampere, Finland, collaborated with an Indian researcher. Deepalaya caters to children from underprivileged communities living in Delhi slums and thus the Indian children had very little to no computer experience. Tesomajärvi is a public school in Tampere, which children from the neighboring area attend, primarily from the middle-income households.

In total, four user studies were conducted. In the first two studies, children from the Deepalaya collaborated with the Finnish researcher [26]. Findings from study 1 showed several challenges towards communication. Therefore, the Bollywood Method [1] was applied in study 2 to create sense of urgency in the gameplay. We postulated that the sense of urgency would overcome face-saving, one of the socio-cultural barriers towards communication, and thus encourage collaboration.

In the Bollywood Method, participants are presented with a dramatized scenario that requires them to take on the role of a character with a specific goal. It was devised by Chavan [1], while conducting usability studies with Indian adults, where participants would be overly polite and not provide any negative feedback. This behavior was largely due to the socio-cultural norms that dictate communication ([6], [31]). In study 2, with the addition of the Bollywood Method, children overcame the socio-cultural and interactional challenges towards collaboration [26].

In study 3 (similar to study 1), children from the Tesomajärvi public school in Tampere collaborated with the Indian researcher. In this study, we observed that Finnish children treated the application like a game and started to explore it without waiting to talk to the

researcher. This also reduced the need for communication and collaboration. Lastly, in study 4, the Bollywood Method was applied with Finnish children (similar to study 2). Study 1 and 3 provide a baseline for evaluations with the Bollywood Method, that was applied to the procedure in study 2 and 4 (please refer to Table 1 for a summary of the studies).

In this paper, we explore the potential of the Bollywood Method to improve collaboration and encourage communication for cross-cultural online learning. We observed differences between Indian and Finnish children using CityCompass. However, with the introduction of the Bollywood Method, the collaborative behaviors of the two groups of children became similar. This paper is organized as follows: we first summarize the related work in the field and describe the CityCompass application. Then, we present the study methodology and compare findings from all the four studies in the results. Finally, we discuss opportunities for Indian and Finnish children to collaborate using CityCompass and our future work towards globally inclusive collaborative applications.

## RELATED WORK

Globally inclusive learning paradigms that promote collaboration among children from various countries and with different cultural and socio-economic backgrounds are not well studied. There is extensive research on applications to promote learning for underprivileged Indian children: Kam et al.'s work on designing digital games for English language learning on mobile phones ([13], [14], [15], [16], [18]), several speech-based English language learning applications ([19], [22]), and the 'Hole in the Wall' studies ([21], [23], [24]). However, connecting Indian children and their developed-world peers has not been studied.

Several studies on cross-cultural online collaboration in human-computer interaction have already shown that culture subtly guides interaction and communication [31]. Of note is the social attributes of a large *power distance* ([5], [6], [31]). In societies with a large power distance, where there is an expectation and acceptance of unequal social status or power distribution, communication is usually initiated by an authority. We observed this phenomenon in study 1 (with Indian children) as the children preferred to confirm their actions, while using the application, before proceeding. Furthermore, the concept of *face-saving*, where the credibility and reputation of neither the child nor the teacher should be threatened [31], is observed in school settings. It is important to consider the consequences of face-saving on motivation towards learning. For example, DiSalvo et al. [3] observed that young African American

adults used face-saving methods to navigate around their parents' or peers' expected attitude towards learning. This is because the socially accepted attitude towards technical education – not wanting to be computer geeks – was contrary to their own preferences. We note here that face-saving is a universal social phenomenon. For example, Juvonen [8] observed that both Finnish and American adolescents preferred to convey socially acceptable and approved reasons for their academic failures in order to save-face. From the perspective of learning in the classroom environment, we therefore consider two main aspects of culture – *power distance* and *face-saving*.

The other challenge towards inclusive cross-cultural collaborations is the variation in access to and experience of technology. In our work, we are looking at overcoming barriers towards collaboration and increasing interaction and communication between participants from different cultures [26]. Cultural and social norms have an inherent influence on communication, and therefore, any challenges that arise need to be addressed.

### The Bollywood Method

The Bollywood Method was developed by Chavan [1] while conducting usability studies with Indian adults, who would hesitate in giving any kind of negative feedback. They would also not share, or down-play, the problems they faced with the system being tested. Therefore, she would present participants with a specific role in a dramatized scenario and then ask them to complete a task. Studies with non-tech savvy Indian users have shown that the Bollywood method overcomes cultural inhibitions allowing users to communicate more openly and provide critical feedback [1]. In our previous work using CityCompass (study 1 and 2), we saw that the Bollywood Method was also affective with Indian children [26], therefore, we decided to explore this method to our work in Finland.

## METHODOLOGY

### CityCompass

The CityCompass, which was used in all four user studies with a similar procedure, is a web-based language learning application that supports remote collaboration for exploring 360-degree panoramic views of a city, with established pedagogical benefits ([9], [10], [11], [12], [25], [26]). It allows people from different countries to collaborate online using only a laptop with an internet connection. In CityCompass, two users, a tourist and a guide, work collaboratively to navigate a pre-defined route to reach a specific destination. The route consists of a sequence of 360-degree panoramas of an actual city, of Tampere or New

Delhi in our studies. The tourist's view has green arrows to select possible exits, as shown in Figure 1. The correct green arrow takes both participants forward, to the next panorama. Selecting the wrong green arrow leads them to a dead-end, which requires the tourist to describe an image of the city that they see and the guide to select the right one from four options. The guide's view has the actual route marked by a blue line, as shown in Figure 1. Each panorama contains several audio-visual informative hints about certain landmarks, called hotspots, played on mouse hovers (also shown in Figure 1, the text in the blue bar reads – The Lotus Temple). Each user has their own panoramic view with which they can interact freely. The tourist and guide have to communicate and collaborate to select the right green arrows to move the game forward.

### Procedure

We followed the same procedure in all the studies, with the exception of adapting the Bollywood Method in study 2 (Indian children) and study 4 (Finnish children). A session started with the moderator providing a brief description of the CityCompass, the user study, and explaining the task. Participants were asked to read the CityCompass instruction screen aloud and to practice panning the panorama and clicking on the image of the green arrow. Participants were also told that there is no time limit for completing the task. All participating children acted as *tourists* and the researchers were the *guides*. Each participant completed the wayfinding task only once and participated in only one study (between-subjects design).

After finishing the task, participants answered a short questionnaire and a semi-structured interview about their experience of the system. Demographical data was collected before the session started and was self-reported by the participants. The setup consisted of a laptop with a mouse, an internet connection, and headphones with a microphone for the conversation. In study 1 and study 2, the city of Tampere was explored using the CityCompass, and the Indian researcher moderated the sessions at Deepalaya whereas the Finnish researcher connected from Tampere.

In study 3 and study 4, the city of New Delhi was explored using the CityCompass, and the Finnish researcher moderated the sessions at Tesomajärvi whereas the Indian researcher connected from a different classroom at the same school. Study 3 ensured consistency with the study 1, and study 4 with study 2. Therefore, it is possible to compare all the four studies. To validate the applicability of the Bollywood Method to Finnish participants, in study 4 a dramatized story, similar to that of study 2, was added at the beginning of the task. The story in Hindi, Finnish, and English is shown in Figure 2.

आप तामपेरे शहर में अपनी कक्षा और टीचर के साथ एक स्कूल ट्रिप पे गए हैं। घूमते-घूमते आप एक अज्ञान जगह पर अपने साथियों से अलग हो गये। अब आपको रेलवे स्टेशन से अपना रास्ता ढूँढते हुए जल्दी-जल्दी अपने साथियों से लाकूनतरी मार्केट में मिलना है, इससे पहले कि वो वहाँ से चले जाएँ। खुशकिस्मती से, एक नागरिक आपको रास्ता ढूँढने में मदद करने को तैयार हैं। आइए चलते हैं।

*Olette saapuneet luokkaretkelle Delhiin, Intiaan. Olet kadottanut muun ryhmän ja olet eksyksissä vieraassa kaupungissa. Sinun täytyy löytää tiesi nopeasti Baha'i-temppelille, josta ryhmä siirtyy bussilla kohti seuraavaa kohdetta. Perille sinut neuvoo paikallinen, joka tietää oikean reitin. Sitten menoksi!*

*You are on a school trip in [city] with your class and the teacher. Somewhere along the way, you got lost from the rest of the group and you are alone in an unknown place. You have to find your way from [start] to [goal] quickly before your group leaves the [goal]. Fortunately, one of the locals has agreed to help you to find your destination. Let's go!*

**Figure 2: The Bollywood story in Hindi, Finnish, and English.**

### Participants

Table 1 shows the participant demographics from the four user studies. For all studies, the average participant ages were 11–12. 25 Indian children participated in study 1, and 22 Indian children in study 2. In the latter, the participants had little to no computer or gaming experience. Several of these participants were taking computer classes at Deepalaya including learning how to use MS Word, MS Paint, and MS Excel. In study 3, 19 Finnish children were recruited from grade 3 of the Tesomajärvi school with 5.5 years of computer experience on average and 3 years of English language classes. 18 out of the 19 participants had a computer at home; 14 of them played games regularly and 4 occasionally. In study 4, there were 6 participants from

the Tesomajärvi school. Study 4 was cut short due to the drastic difference observed in task times.

### RESULTS

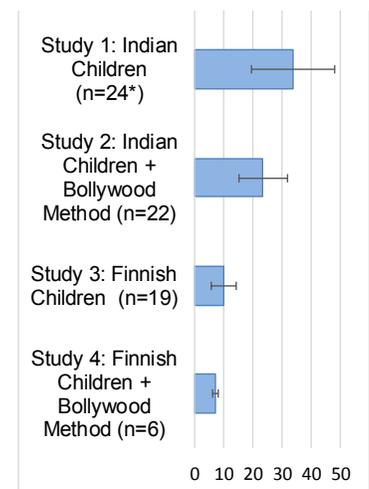
Figure 3 shows the average task completion times of the participants in the four user studies. We observed large differences in the overall task times between the Indian (study 1:  $M=34$  minutes,  $SD=14.7$ ) and Finnish (study 3:  $M=10$  minutes,  $SD=4.4$ ) participants. An independent samples t-test revealed a statistically significant difference between study 1 and 3:  $t_{29,361}=7.272$ ,  $p=0.000$ . Despite contextual differences between the cities in the tasks, they cannot explain the considerable contrast in the task times.

Even with the clearly different overall task times, there were no statistically significant differences in the number of dead-ends between the Indian (study 1:  $M=2.9$ ,  $SD=2.8$ ) and Finnish (study 3:  $M=2$ ,  $SD=1.9$ ) participants. Finnish participants, however, panned the virtual view more per minute (study 1:  $M=5.6$ ,  $SD=2.7$ ; study 3:  $M=12.2$ ,  $SD=4.7$ ;  $t_{42}=-5.917$ ,  $p=0.000$ ) and activated more hotspots per minute than their Indian counterparts (study 1:  $M=2$ ,  $SD=0.9$ ; study 3:  $M=3.6$ ,  $SD=1.3$ ;  $t_{28,934}=-4.521$ ,  $p=0.000$ ). This can be attributed to their previous computer experience that increased their interaction confidence.

Comparing the Finnish participants (study 3) and Indian participants with Bollywood Method (study 2) shows statistically significant differences between the task times (study 2:  $M=24$  minutes,  $SD=8.4$ ; study 3:  $M=10$ ,  $SD=4.4$ ;  $t_{32,507}=-6.689$ ,  $p=0.000$ ), hotspots activated per minute (study 2:  $M=2.2$ ,  $SD=1.0$ ;  $M=3.6$ ,  $SD=1.3$ ;  $t_{33,845}=3.828$ ,  $p=0.000$ ), and pans per minute (study 2:  $M=7.8$ ,  $SD=3.9$ ; study 3:  $M=12.2$ ,  $SD=4.7$ ;  $t_{35,035}=3.298$ ,  $p=0.002$ ).

	Study 1 Indian Children	Study 2 Indian Children + BM*	Study 3 Finnish Children	Study 4 Finnish Children + BM*
Number of Participants (Male, Female)	25 (M4, F21)	22 (M9, F13)	19 (M9, F10)	6 (M3, F3)
Mean Age in Years (SD)	11 (SD 2)	12 (SD 2)	12 (SD 1)	12 (SD 1)
Mean Years Studying English (SD)	5 (SD 3)	4 (SD 3)	3 (SD 0)	3 (SD 0)
Mean Months studying Computers in School (SD)	7 (SD 8)	9 (SD 18)	66 (SD 12)	62 (SD 16)
First time computer users	3	11	0	0
Participants with computer at home	2	1	18	-
Participants with gaming experience	11	1	14	-

**Table 1: Participant demographics for the four user studies (\*Bollywood Method).**



**Figure 3: Task times (in minutes) for the four studies.**

Although the task times remain considerably different, the mean difference in task times between the Indian and Finnish participants (study 1 and study 3) was 24 minutes. The difference in task times between the Finnish and Indian participants with the Bollywood Method applied (study 3 and study 2) was 14 minutes. We acknowledge that the task times for the Indian participants also include the time taken to learn how to use a computer.

Figure 4 shows the average user experiences given by the children in three of the studies (1–3). Most of the ratings show a positive experience (>4) of using the application. It is interesting to note the differences between the Indian and Finnish participants to three questions; (a) “Using the application is fast”: even with a much larger overall time between the Indian and the Finnish participants, the Indian participants found the pace of the application comfortable possibly due to their low computer and gaming experiences. (b) “I believe I learned while using the application”: Finnish participants rated the learning lower, possibly because of their previous computer and gaming experiences. (c) “The hints offered by the application are annoying”: typical Indian pedagogy encourages pupils to learn by verbal repetition, especially in language learning, whereas in Finland, the emphasis is on interaction and social skills.

## DISCUSSION

Previous studies on cross-cultural online collaboration already show that culture subtly guides interaction and communication [31]. We believe that online pedagogies for schoolchildren are influenced by their cultural backgrounds and their level of computer experience and access. Our research uncovered several differences that affect collaboration between the two uniquely different cultures, Indian and Finnish. We identified those as differences in social communication and computer experience.

In our first study, we observed that Indian children displayed a need for authoritative confirmation and reluctance to answer negatively to the Finnish researcher. We attribute this to the universal phenomena of *face-saving* in schools and other learning environments ([2], [8], [17], [31]). Moreover, Asian cultures also exhibit a large *power distance*, where authority figures must not be contradicted. For collaboration, this puts the onus of communication on the authority figure. Additionally, technology access and exposure also played a role towards the collaboration.

Adapting the Bollywood Method from Indian adults [1] to children and from usability evaluations to cross-cultural online collaboration, in the second study, we added a scenario around the wayfinding task, creating a sense of urgency. The scenario was provided in plain text form, just

before the pupils started using the application. This sense of urgency provided (a) game-like elements that reduced the implicit focus on using a computer and (b) a socially acceptable ‘face’ for participants to critique and contradict authority figures, thereby reducing the *power distance*. Therefore, adapting the Bollywood Method to the CityCompass created a socially acceptable and comfortable environment for cross-cultural collaboration [31]. They have a sense of urgency to finish the task and reach the goal.

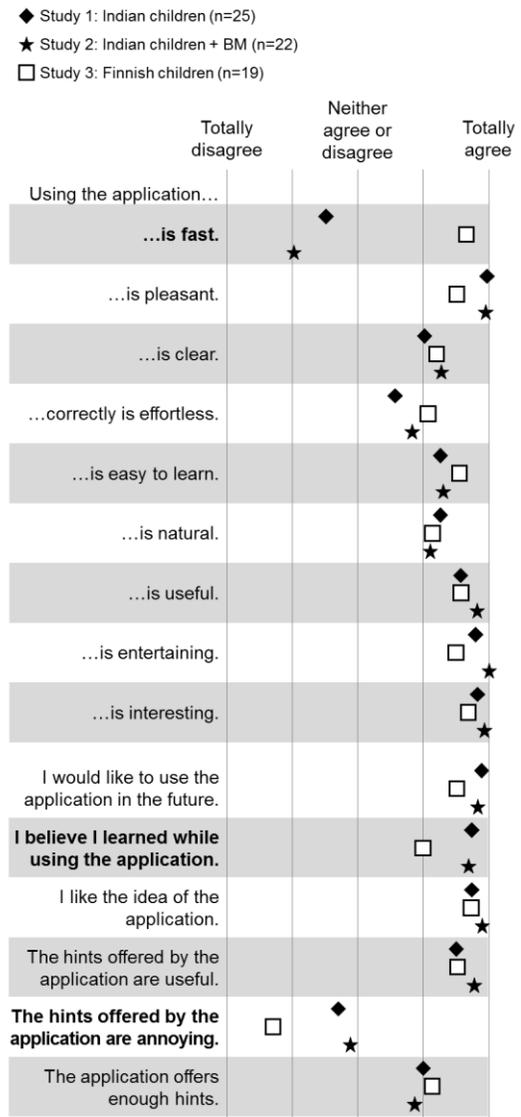


Figure 4: Average UX ratings from the three user studies.

In the third study, we observed that Finnish children considered CityCompass to be a game, which brought in a sense of urgency. This attitude towards online applications, even those for learning, potentially arises from the participants’ previous computer and gaming experiences. Adapting the Bollywood Method to Finnish children in the fourth (short) study, showed similar outcome as that of the

study with Indian children with the Bollywood Method – that is, the sense of urgency increased even further. However, in this case, the communication and collaboration was further limited. Therefore, the fourth study was cut short to identify ways to improve communication and collaboration for Finnish participants. This is in direct contrast to what is desirable for the Indian participants-increasing game-like elements to encourage collaboration. Overall, the Bollywood Method shows versatility as when applied to both the Finnish and Indian cultures, it influenced game-play behaviors.

In the present work, we applied the Bollywood Method by presenting a dramatized scenario before the task. The scenario needs to match the application domain, be appropriate for the participant’s culture, and be relatable for the participant even if overtly dramatic [1]. Our story was developed based on interactions with participants in the first study, who found it strange and shocking that the panoramas in the CityCompass are of an actual city and not images (like realistic paintings). Upon further enquiry from the teachers at Deepalaya, we learnt that pupils did not travel outside of Delhi for school trips, or with their families, unless it was to their village. We understand that the scenario might not seem overly dramatic, especially from a western perspective, where schoolchildren travel on group trips lasting several days. This is also common in (expensive) private Indian schooling. But given the socio-economic background of families of children at Deepalaya, (children attend free government schools and go to Deepalaya for remedial classes), this scenario is fairly shocking. However, the “dramatic-ness” of the story for Finnish pupils was not studied.

Finnish participants collaborated with a sense of urgency to reach the goal as quickly as possible rather than focus on collaboration. Indian participants had the opposite interaction behavior; they were risk-averse and requested multiple confirmations before clicking on a green arrow. By adding a dramatized story at the beginning of the task, a sense of urgency was created to improve communication and collaboration. We also validated the potential of the Bollywood Method with Finnish participants by using the same dramatized story, and observed similar results; Finnish participants took even more risks and less time. However, the best scenario for collaboration between Indian and Finnish children requires improvements in communication. Therefore, it would also be interesting to see whether the Bollywood Method could **reduce** the sense of urgency in Finnish participants by presenting a different scenario. This is especially desirable for participants who are either only interested in completing the wayfinding task as quickly as possible or prefer individual play, instead of

collaboration. Going forward, we plan to conduct a study with Finnish participants where we add a dramatized story to promote communication and collaboration. This can create a comfortable environment for Indian and Finnish children to collaborate, regardless of their computer and gaming experience and socio-cultural differences.

We note here that the cultural and social context of collaboration with a researcher may or may not be comparable with collaboration with a peer, as we observed the need for *face-saving* and authoritative social interaction. However, we argue that our results should easily extend to peer-collaboration due to the universality of face-saving, also among peers ([3], [8], [31]). Moreover, in typical learning environments, the presence of an authoritative figure is almost always expected, and learners should be supported in both social situations – when collaborating with a peer or with an adult.

Our work contributes to the growing emphasis on developing educational applications that are globally collaborative and inclusive to children from underprivileged communities. Previous work in this domain includes the Granny in the cloud, where teachers across the world Skype into rural Indian classrooms [24]. However, globally collaborative one-on-one interactions are not well studied. In this work, we showcased the potential of connecting children from different cultural and socio-economic backgrounds towards common learning goals. Overall, we believe our results can be extended to online learning systems aimed at cross-cultural collaborations to other domains and cultures, allowing children from different cultures and backgrounds to experience the globalized world we live in.

## CONCLUSION

Social communication and previous computer and gaming experience affect interaction styles in online learning environments; therefore, for cross-cultural collaborative interaction we recommend using the Bollywood Method, where tasks are rooted in dramatized scenarios. With our work, we are aiming to connect Indian and Finnish children for meaningful collaborative tasks with the CityCompass in the future. To do this, the differing communication styles of these child groups need to be brought closer to each other. As presented in this paper, we have successfully encouraged Indian children to communicate by applying the Bollywood Method to create a sense of urgency. Going forward, we will study whether the method could be used to, in turn, reduce the sense of urgency in Finnish children with a different scenario, but with the same goal to encourage communication.

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## SELECTION AND PARTICIPATION OF CHILDREN

Studies in India started with a signed consent from Deepalaya HR and by giving detailed presentations to the teachers. Pupils were selected with the help of their teachers on a volunteer basis and were informed that they could stop participating at any time. Similarly, pupils at Tesomajärvi were recruited with the help of their teachers and consent was taken from their parents prior to the study. All pupils participated in a classroom in their school and during their school day.

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