The Effectiveness of Publicly vs. Privately Assigned Group Leaders Among Learners in Rural Villages in Tanzania

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Abstract: Research studies show that teachers increase the success of education technologies in rural settings by supporting students via technology support, domain-relevant explanations, enforcing discipline, and maintaining student engagement. However, a teacher's presence hinders student collaboration in some cultural contexts, and some students may not have a teacher or knowledgeable adult who can provide this support. We conducted an experiment with K-1 students (N=36) in a rural Tanzanian village, where we trained students to provide technology support for their peers under different experimental conditions. We found that with basic technical training and social awareness of the assigned leaders, students can indeed provide peer support in the absence of a teacher, and additionally enable collaboration. We challenge the popularly held notion that natural leaders will emerge and support students' technology and learning needs without adequate training, and discuss the implications of our findings in the deployment of technologies in similar socio-cultural contexts.

Introduction

The number of out-of-school children in rural and urban regions of Sub-Saharan Africa is increasing at rates that traditional schooling infrastructures cannot accommodate. Current estimates by UNESCO report that there are over 63 million out-of-school children, with over 50% of those children living in Sub-Saharan Africa (1). Those estimates have been increasing over the last few years despite government commitments to address the issue. Of the children enrolled in school, less than 20% score above minimum proficiency on math and reading assessments (2). Popular initiatives to address this challenge involve deploying educational technologies to students in and out of schools, particularly as hiring the large quantity of necessary qualified teachers is difficult (Buchele & Owusu-Aning, 2007). However, such wide-scale initiatives have mostly been unsuccessful due to a lack of understanding of the local context of the end users, as well as a lack of technical infrastructure and support for these initiatives (Therias, Bird, & Marshall, 2015; Warschauer & Ames, 2010).

Despite the failure of these large-scale, one-size-fits-all initiatives, several studies have shown that when deployed using a bottom-up approach, where the social, cultural, and infrastructural needs of the end users are prioritized, educational technologies can indeed lead to positive learning gains (Hollow & Masperi, 2009; Therias et al., 2015). These studies emphasize that providing support for students, including technical and domain knowledge support, is critical to the success of education technologies in under-resourced communities. Other types of support needed by students include help navigating learning applications, scaffolding their lack of basic digital literacy, and maintaining engagement while learning with technology (Uchidiuno et al., 2018).

A number of these large-scale education technology initiatives have been developed with the expectation that natural leaders will emerge among peers and provide this much needed support, without the need for a knowledgeable adult (Mitra et al., 2005; Papert, 2006). Some prior CSCL research has investigated the emergence of leaders among collaborating groups (Sun, Jackson, Burns, & Anderson, 2017), including peer-nomination and self-perceived leadership qualities (Xie, Sun, & Lu, 2015). In our study, we observed groups of K-1 students in a rural village in Tanzania using an Android tablet-based literacy and numeracy curriculum without the support of a teacher. As our own recent work has indicated that emergent leadership is rare in this context, in this study we build on prior work by exploring the effects of assigning leaders within a group of learners, under two conditions that differentially bestow authority on these leaders: a publicly assigned group leader; and a privately assigned group leader (in which the leader is assigned, but not publicized to the rest of the group). Based on scores from an administered pretest, we trained selected leaders on how to navigate the tablet application and perform basic troubleshooting. We investigate students' help-seeking and help-giving behaviors in these different conditions and provide insights on how to better foster peer support for educational technology in the absence of a teacher or knowledgeable adult.

Literature review

The classroom is an organized system of social interactions with institutional and socio-cultural norms influencing students and teachers behaviors (Ädel, 2011). These norms influence help-seeking and help-giving behaviors, and may affect the efficacy of educational interventions if unaccounted for. For example, in certain contexts, teachers encourage children to collaborate freely with one another (Halloluwa, Vyas, Usoof, & Hewagamage, 2018; Mann, Hinrichs, Read, & Quigley, 2016), while in others, collaboration in the presence of a teacher is regarded as cheating (Uchidiuno et al., 2018). Peers have been found to support each other by engaging in discourse that can bring about positive learning gains, including "modelling, assisting, directing, tutoring, negotiating, affirming, and contradicting each other" (Stone & Christie, 1996). Without training in meaningful help-giving behaviors, students are likely to provide just the answers to their peers' questions rather than elaborated, domain knowledge explanations (Roscoe & Chi, 2008). The quality of this discourse depends on students' prior knowledge and self-efficacy, as well as their personal relationships with one another (Parr & Townsend, 2002). Prior studies also provide evidence that the quality of help peers provide for one another depends on the closeness of their friendships (Graesser & Person, 1994; Webb & Mastergeorge, 2003).

The support that students offer one another becomes even more important when educational technologies are deployed in unsupervised settings, where children have to rely on each other to navigate and learn from such systems. Some research studies have reported positive outcomes from such scenarios, reporting an increase in student curiosity (Mitra & Dangwal, 2010), and even marginal learning gains (Breazeal, Morris, Gottwald, Galyean, & Wolf, 2016), but do not provide any insights on the social interactions that lead to such outcomes. For instance, Kumar et al. provide rich insights from conducting an unsupervised learning research study using a mobile phone in rural parts of India (Kumar et al., 2010). They found that beyond infrastructural issues such as inconsistent electricity, factors such as gender, caste, and time of day significantly affected mobile usage of learning content. Children learned on average three new words per week for 9 weeks. The authors report that children learned to support their peers from watching the experimenters navigate the devices but provide few details on how this transfer of knowledge occurred.

While these studies expected (and in some cases did observe) natural leaders to emerge amongst the group, other research studies have provided insights on how peers interact when they are explicitly assigned to offer support in learning contexts. Fantuzzo et al. examined the efficacy of reciprocal tutoring, where students take turns providing support for their peers, and fixed-role tutor assignments (Fantuzzo, King, & Heller, 1992). Reciprocal tutoring was found to have more benefits over fixed-role assignments, however, is impractical for contexts such as our target demographic where most students are learning using a technology medium that is foreign to them. Group leaders tend to provide domain knowledge support in primarily two ways - providing answers only or stating facts (knowledge-telling) and giving reflective and elaborated explanations (knowledge-building). These types of support differ not only in the quality of feedback a help-seeker receives, but also benefit the help-giver differently - peer-tutors who provide knowledge-building support score higher on posttests as they organize their knowledge and monitor their understanding better (Roscoe & Chi, 2007). When students are not trained to provide constructive and knowledge-building feedback to their peers, they may likely provide knowledge-telling feedback, but studies show that deeper questions from help-seekers can elicit more elaborate, knowledge-building responses (Duran & Monereo, 2005).

Research such as (Kumar et al., 2010) has provided limited evidence that when children are equipped with technical skills, they can naturally emerge as leaders and provide support for their peers, without having an official assignment as a group leader. Other studies show that behaviors differ when leaders are assigned rather than emergent (Wickham & Walther, 2009) We investigate whether this finding applies in a different cultural context by equipping children with basic technical knowledge, and asking them to support groups where they are officially assigned as the group leader. We deployed an Android tablet-based learning system with *unsupervised* groups consisting of a child with domain knowledge and technical competency, their closest friends, and randomly assigned peers. We vary the experiment conditions by publicly assigning a leader in some groups, and not in others. We use these observations to answer the following research questions:

- To what extent do knowledgeable children take on the role of a leader within a group of learners, when either privately or publicly assigned the authority to do so?
- What kinds of support (knowledge-telling vs knowledge-building) do assigned leaders offer across social factors such as gender and close friendships in this cultural context?

Methodology

This study was conducted in partnership with a Swahili-speaking, rural village in a Northwestern region of Tanzania. Members of our research team have conducted research in the region over the last three years. The village was limited in physical and technical infrastructure with inadequate power or clean water. Three mobile

network providers serviced the village. Throughout our stay (and in previous visits), we observed families with mostly feature phones without internet connectivity, however, a few school teachers owned basic Android smartphones. We did not observe any tablets in the village homes, schools, or public settings throughout our stay. Consent (in Swahili) and approvals were obtained from students, parents/guardians, the school administration, and the village council with help from a native Swahili speaker.

The Swahili learning application focused on the following areas: literacy (letter and phonemic awareness, writing, stories curated from the African Storybook Project - http://www.africanstorybook.org/), and math (number identification, number writing, addition and subtraction). Most system interactions involved tapping on the screen, although some require tracing, writing, or speaking to engage, with a speech recognition engine validated in various African contexts (Mills-Tettey et al., 2009), and video tutorials with continuous finger placement scaffolds to support children's' digital literacy . The Swahili audio prompts and instruction were recorded by a Kenyan Professor of Swahili, who has taught Swahili from kindergarten to university levels. The Swahili video application tutorials were recorded by a Tanzanian instructor of Swahili, who grew up in a region about 10 hours away from the village where the study was conducted. All communications with the children were translated by a native Swahili speaker who lived in the same village and was well-known to the children. More details about the learning application can be found in (Uchidiuno et al., 2018).

To ensure that we observed a sufficiently broad sample across experimental conditions, we structured our observations into 24 discrete sessions during which six groups of six children each engaged with the tablet software. Each observation lasted about 1 hour. In these sessions we observed a total of 36 unique children; this included 18 girls and 18 boys from grades K-1, ages 5 to 10 depending on year of entering school. Before the sessions began, we gave all the children a paper pre-test covering letter and number recognition, letter and number writing, simple word problems, and listening comprehension. These pre-tests were administered by Swahili speakers who read the questions one by one to each child, and recorded their responses. We noted down the students who scored the highest, and distributed them equally among the groups. Following the pretest, we ran a baseline session with each group, allowing students' natural interaction patterns to emerge. We selected six children who performed well on the pre-test *and* quickly learned to navigate the tablet application without adult assistance. We selected the highest-scoring children as leaders just in case their peers needed domain knowledge support in addition to technical support, and assigned them as leaders for each group in the experiment scenarios. We started forming the groups by asking each leader to select two of their best friends from the class - each group was comprised of a leader, the leader's selection of their two best friends, and a random assignment of three other children from the class, balancing each group by gender. After forming groups, we informed the leaders privately that they performed the best in the pre-test and with navigating the system, and were now responsible for supporting their group. We conducted a training session with all six group leaders to reinforce practices of navigating each application without assistance, as well as performing basic troubleshooting tasks e.g. helping a peer return to the learning application if they exit accidentally. After the training, all leaders could navigate the tablet and application without assistance.

Table 1: Group Information with Summary of Pre-Test Scores, the leader's Score, and Experiment Condition

Group #	Age Range	Score Mean	Score SD	Score Range	Leader's Score	Leader Condition
1	5-10	34%	23%	8-72%	72%	Privately Assigned Leader
2	5-7	46%	14%	42-60%	60%	Privately Assigned Leader
3	5-7	46%	12%	32-62%	62%	Privately Assigned Leader
4	6-9	72%	14%	52 - 90%	90%	Publicly Assigned Leader
5	6-8	79%	11%	65-93%	90%	Publicly Assigned Leader
6	6-8	71%	13%	55-88%	88%	Publicly Assigned Leader

Before the start of the sessions, we reminded the leader of their job to help their peers, as no adults would be around. For 3 groups, we shared this privately with the leader so other group members did not know the group had a leader (privately assigned leader condition), however, in the other 3 groups, we made this announcement publicly, informing the group that the leader would answer all questions they had (publicly assigned leader condition). All groups completed 4 sessions each - 1 initial baseline session without a leader assigned and 3 sessions with an assigned leader. Following the baseline, we conducted two periods of classroom observation to better contextualize each leader's natural peer interactions. leaders are summarized below as "L#"; the number corresponds with their group:

- L1: 6 y/o girl - Quiet. Answers all questions correctly, does not interact much with her peers.

- L2: 7 y/o boy - Energetic, sometimes disruptive. Tries to answer all questions asked by teacher before others can, so the teacher sits him in the back, and never calls on him to answer questions. Once when the teacher left, he ran to the front and pretended to teach the classroom.
- L3: 6 y/o girl - Usually answers correctly when called on. Observed mouthing an answer to a boy called to answer question when he did not know the answer. Usually sits with her friends in the front, who all wait for her to write an answer on a worksheet, and then then copy her for in-class activities.
- L4: 9 y/o boy - Quiet in class. Does not speak except when directly asked a question, does not disrupt.
- L5: 8 y/o girl - Quiet but engages in occasional banter with friends even when the teacher is present.
- L6: 7 y/o girl - Quiet but also engages in occasional banter with her friends.

No researcher or adult was present in the room with the students during the study sessions. Instead, these unsupervised sessions were video recorded from multiple angles to capture natural student interactions. The team analyzed the data from all group sessions, recording qualitative observations of the student interactions with the tablet and each other. Next, the team reviewed the videos, notes, and observation logs and identified emergent themes related to the types of help-seeking and help-giving behaviors surrounding each group leader following a grounded theory approach (Corbin & Strauss, 2008). Six themes of student behaviors emerged: 1) student distracting the group, 2) leader addresses student distraction, 3) student asks leader for help, 4) student asks leader to help a peer, 5) student (not leader) helps another non-adjacent student, and 6) leader helps a non-adjacent peer. Next, we split the sessions equally among 2 team members for categorization according to the 6 themes. A third team member reviewed and coded all 24 sessions to validate the categories created by the other team members, breaking each session into 30 second intervals and adopting a partial-interval recording method (Hintze, Volpe, & Shapiro, 2002). Finally, we triangulated all observations related to these themes with logs captured by researchers in the field, debrief recordings, follow-up interviews with teachers, and photographs captured on site to ensure that all evidence were mutually supportive. After all sessions were categorized, all members of the team each reviewed the findings for all 24 sessions, discussed all areas of disagreement, and re-categorized findings as agreed upon by the entire team. We worked with native Swahili speakers from Tanzania to help translate interactions, as well as provide insights on the cultural underpinnings of those interactions. This study design and data analysis methodology has been used and validated in previous CSCL research studies e.g. (Pauw et al., 2015).

Findings

Baseline student behavior

As soon as the sessions started and the adults left the room, the children smiled at each other, looked around briefly, and then started interacting without prompting. These interactions included sharing new activity types with their adjacent peers, sharing a funny activity, celebrating their accomplishments, singing nursery rhymes together, and even repeating spoken tablet instructions in unison. We observed lots of play (and real) fighting in the room as they encroached on each other's tablets, and children intentionally distracting each other from staying on task. If an adult re-entered the room for any reason (forgot an item, child in the session called for their help, end of session, etc), the children stopped all interactions and focused on their tablets.

Without an assigned leader, students generally provided help when **all** of the following conditions were true: 1) they noticed a peer struggling or the peer asked them for help, 2) the peer is sitting adjacent to them, 3) they are not engrossed in their own work, and 4) they knew how to help (vs trying to find a solution to a new problem). In general, their behavior mirrored the classroom observations - quiet students kept to themselves even when other children tried to interact with them uninvited, and talkative students were the most vocal (and disruptive) in their sessions. The students connected the learning application to what they learned in the classrooms - on several occasions, we observed children bringing out their notebooks from their bags to double check answers before they selected answers on the tablet. They primarily communicated with their adjacent peers, and those whose screens they could easily see. Across all six groups, we observed only two instances where a student helped a non-adjacent peer. Figure 1 shows the student seating arrangement in the classroom. Students sat in a row, all facing the same direction, allowing them to interact with their peers and see their work. There were no observable differences in how girls interacted with other girls vs boys (and vice versa), although friends seemed more likely to share funny stories and new activities with each other.

In all interactions observed under this condition, students provided knowledge-telling support to their peers either voluntarily or when solicited; they either selected the answers for their adjacent peers or told them what answer to tap without any elaboration. We observed one instance of student collaboration in this condition

(and another in the publicly assigned leader condition) when knowledge-telling was insufficient. In one interaction with L5, an adjacent peer was struggling with a tracing task. After she asked L5 for help, L5 said "andika" [Swahili for "write"]. The girl followed L5's instruction, but her answer was still not accepted because she wrote beside (rather than over) the trace outline. Then L5 reached in to help but also wrote beside the outline, resulting in a rejected response. They looked for a teacher, but no one was close by, so they tried different strategies until they learn the correct way to trace on the tablet.

Figure 1. Typical seating arrangement in experiment sessions.

Student behavior in privately assigned leader condition

Students in this condition behaved similarly to the baseline condition. L1 remained quiet throughout her sessions, only interacting with adjacent peers, and volunteered help when she noticed a struggling adjacent peer. Since she was not revealed as the group leader, non-adjacent students did not ask her for help. When engrossed in her tablet, she ignored most requests for help even from adjacent students. This observation was consistent in all of L3's sessions as well. She freely chatted with adjacent peers, but also ignored their requests for help when engrossed in her own work. On the occasions where L1 and L3 helped their adjacent peers, *they showed very little persistence* and routinely abandoned them if their attempt was not a quick fix on the first or second try.

There were clear negative consequences when a student needed help but didn't receive it. In Group 1, a boy struggled with basic application navigation, and could hardly complete a single learning activity in all three sessions despite sitting next to L1 in one session. Also in a session with L1, a student gave up and left the session after trying for 30 minutes to start a learning activity (including asking her for help twice), while another started to wipe tears from her eyes after repeated unsuccessful attempts at getting herself back on task. Figure 2 shows a boy in Group 3 who needed help, and his reaction when he finally learns to navigate the application after receiving help from the girl right beside him (not L3).

L2's behavior as a privately assigned leader was quite different from L1 and L3. In the first session, he interacted mostly with one of his best friends similar to his behavior in the baseline condition. After privately reminding him of his responsibilities prior to the next session, he spent most of his time walking around the room and helping every struggling student (similar to how his teacher behaved in his classroom), without paying much attention to his own tablet. He was only asked for help 4 times from his adjacent friends throughout the session, but volunteered help to 18 additional non-adjacent peers. When his peers noticed that he was providing this help, they called on him to help other struggling peers, and he continued to hover around their tablets to review their progress. If a peer paused briefly, he ran over to solve the problem even if they did not ask for help. Some did not welcome the constant, unsolicited help - near the end of one session where L2 "helped" a girl constantly, she shoved him away when he walked over to her. His monitoring also quickly turned into behavior enforcement. One of the activities in the learning application involved a racecar that made screeching sounds. Students quickly figured out how to exploit this sound and enjoyed producing an almost-constant screech, therefore distracting the whole group. In the first session, L2 and his adjacent peer engaged in this distraction, but by the second session, he monitored and turned off students' tablets if they tried the exploit. His enforcement tactics became progressively stronger in each session, and he started hitting kids on the head and addressing the whole group sternly when he thought they were not paying attention. Although some children had problems with his style of help-giving, overall it had positive effects on the group. Most children stayed on task, students started calling him for help for themselves and for others, and others started to emulate him by standing up and walking around to help as well. Figure 3 shows L2 addressing a student who was distracting the group. On the average, L1 and L3 ignored 79% of help requests overall (and all requests from their friends), while L2 ignored only 33% of his requests for help (13% from his friends).

Figure 2 (L-R). Struggling boy; peer notices and helps; excitement when he gets questions correct.

Figure 3. L2 addressing a student who was distracting the entire group.

Student behavior in publicly assigned condition

Publicly assigned leaders had fewer help-giving restrictions; they generally provided help either if they were asked or if they noticed a peer struggling. Unlike L2, none of the leaders in this condition (L4, L5, L6) hovered around the entire group. Despite their working steadily and constantly on their tablets, they responded to most requests for help. The other children in the groups chatted with their adjacent peers about new activities and funny stories, and even attempted to help each other first before calling on the leader. On the average, leaders in this condition responded to requests for help 75% of the time (77% from their friends). They were able to discern when they were called for non-help requests such as discovering new application activities. L5 was even able to tell when she placed someone in an application that was too easy for them. She restarted a boy's application, and placed him in an alphabet song. Immediately, she exited the application, and switched it to a more difficult story for him to read. Although the leaders were called upon frequently in the first session, the help requests decreased in subsequent sessions, suggesting that students became more proficient at navigating the tablets without the leader. By the 3rd session, the publicly assigned leaders got the same number of requests from the whole group as the privately assigned leaders from their adjacent peers. Figure 4 shows a chart of the average number of times the leaders were called upon as the sessions progressed per condition.

The biggest difference between the help offered by publicly vs privately assigned leaders was the degree of leader persistence. We did not observe any cases where the leader abandoned a student even when they could not figure out a solution. One student in Group 4 accidentally exited the application but could not open a new instance. She asked L4 for help, but he could not figure out a solution after several attempts. He started to walk back to his seat but changed his mind, knelt beside her, and kept trying. After much trial and error, she found the application switcher button and selected the learning application. Instead of returning to his seat after this success, he reproduced the problem, so he could practice the solution she discovered. Following that, he returned to his seat. Similarly, L5 spent over 5 minutes trying to help a girl with a technical issue with constant application crashes. After several unsuccessful tries, L5 left the session to seek a help. The application had to be reinstalled to fix the error.

Finally, the leaders helped to maintain engagement with the learning applications. All students enjoyed exploiting the racecar game's screeches. Unfortunately, the noise distracted everyone in the group and increased off-task behavior. It caused students who were trying hard to focus to start tapping the tablet without regard for the current activity, or scribbling furiously in writing activities. Unlike the privately assigned leader condition, the publicly assigned leaders initially joined the fun, but quickly worked to establish order in the groups. L4 warned the students to stop misusing the application; L5 and L6 resorted to turning off students' tablets if it distracted their group, and in one incident, L6 even seized a peer's tablet. Other members of the group began to call for the leader when someone was bothering them individually, and the leaders routinely intervened. This was an unexpected but welcome benefit of having publicly assigned leaders in the group because these interventions minimized the time that students were off task compared to the other leadership conditions.

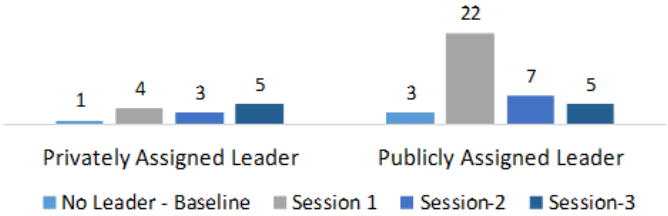

Figure 4. Average Help-Seeking Requests to in Privately vs Publicly Assigned Leader Conditions.

Discussion and conclusions

Unassisted learning educational settings are becoming more popular due to the increasing demand for education where traditional schooling facilities and instructors are scarce - our research contributes to the body of

knowledge that maximizes their success. The expectation that children, without formal training or assignment, will provide support in unassisted learning situations seems intuitive given their innate curiosity, and previous findings from other cultural contexts. However, our research provides evidence that socio-cultural factors do not only affect the ways that children engage with educational technologies, but also in their willingness and ability to support one another, as well as the quality of help they provide. This is not to say that natural leaders in this cultural context do not exist - a student like L2 demonstrated his enjoyment for teaching and proctoring both in the classroom, and in the experiment sessions. However, in a culture like the one we studied where teachers and adults are likely the singular source of authority, this kind of behavior may be punished similar to seating L2 at the back of the class, and refusing to call on him or answer any of his questions. We also provide evidence that children who show natural helping tendencies in the classroom (like L3 whose classmates depend on her for answers), even when trained, do not automatically emerge as leaders for their peers at the expense of their own interest. Our research shows that in this cultural context (and similar), help-giving did not vary by friendships or even gender, and students provided the best quality of support when they were trained to help **and** when there was a social expectation of them providing such support. Leaders did not just naturally emerge similar to other studies exploring unassisted learning situations e.g. (Kumar et al., 2010) and (Mitra et al., 2005). Rather than expecting children to naturally provide support for their peers, such unassisted learning programs should train and educate children on who, how, and when to ask for support to maximize their success.

Publicly assigning the role of a leader conferred significant benefits to all students (leaders included). Group members, regardless of their proximity to the group leader received much needed help with the learning application, and we observed no incidents of children frustrated, abandoning the sessions, or going multiple sessions without engaging with the learning application (unlike the privately assigned leader condition). Leaders showed that they could regulate their learning and that of their peers, deciphering when a student really needed help vs when they could figure it out for themselves, and leaders became more persistent and provided better support by practicing more nuanced ways to bail their peers out of trouble, improving the collective knowledge of the entire group. These results are in accordance to previous findings that show that students' ability to influence and adjust their own cognitive and help-giving behaviors and that of others is optimal for learning and working together (Zimmerman & Schunk, 2011). Another unexpected but very positive effect of publicly assigning leaders was how much the leader helped to control disruptions to the group. In our experiment sessions, when one student started causing disruptions, the whole group (including those who were trying hard to stay focused) got distracted as well. Having students who automatically took the responsibility upon themselves to manage disruptions was important for maintaining student engagement. Finally, our research provides evidence that in a cultural context where collaboration is often discouraged by teachers e.g. (Uchidiuno et al., 2018), carefully designing unassisted learning environments can foster collaborative behaviors even for simple writing tasks. Further research is required to investigate how these behaviors change as the tasks become more complex, or when the students are explicitly engaged in collaborative tasks.

Our study is limited in several ways - the lack of in-depth explanations provided by students may be a factor of their age and developmental level, as well as the domain area not requiring much explanation (early math, letter identification, and early reading). Future studies should investigate these help-seeking and help-giving behaviors among older students in domain areas that require more explanations such as math and science targeted at later grades. Also, the only training children received was related to technology support. They were not trained on how to properly give domain knowledge feedback to their peers. Although, our study provides evidence that untrained students do not provide knowledge-building naturally, further investigation is required to determine the help-giving behaviors of students who are trained to give proper feedback. Finally, in our study we qualitatively observed a small group of high performing leaders across multiple sessions - these insights may be different in a larger scale study, or with students with lower achievement.

Endnotes

(1) http://uis.unesco.org/sites/default/files/documents/fs48-one-five-children-adolescents-youth-out-school-2018-en.pdf
(2) https://www.brookings.edu/blog/africa-in-focus/2017/10/06/figures-of-the-week-africa-education-world-development-report-2018/

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