

Teaching the Arabic Alphabet to Kindergarteners

Writing Activities on Paper and Surface Computers

Pantelis M. Papadopoulos¹, Zeinab Ibrahim¹ and Andreas Karatsolis²

¹*Carnegie Mellon University in Qatar, Doha, Qatar*

²*Massachusetts Institute of Technology, Cambridge, U.S.A.*

Keywords: Early Childhood Education, Writing, Arabic Language Learning, Tabletop Surface Computers.

Abstract: This paper presents initial results regarding writing activities in the context of the ALADDIN project. The goal of the project is to teach Modern Standard Arabic in 5-year-old kindergarten students in Qatar. A total of 18 students, enrolled in the 'Arabic Class', participated for 9 weeks in the activities of the project. All students were native speakers of the Qatari dialect. Learning activities involved both typical instructional methods, and the use of specifically designed tools for tabletop surface computers. The paper focuses on writing activities and on how the affordances of surface computers affected students' performance and attitude towards the Arabic class and, consequently, the Arabic language.

1 INTRODUCTION

The general scope of our work in the 3-year long ALADDIN (Arabic LANGUAGE learning through Doing, Discovering, Inquiring, and iNteracting) project is to teach Qatari students in kindergarten Modern Standard Arabic (MSA) and help them understand the connection between MSA and the dialect. This research draws extensively upon the works of Ibrahim (2000, 2008a, 2008b, 2009) pertaining to Arabs language attitudes, the relatedness of the MSA to the dialect and the native speakers awareness, lexical separation as a consequence of diglossia, the use of technologies in Arabic language learning, and language planning and education.

At the age of 5, native speakers in Qatar follow a rather scholastic instructional method, based mostly on Behaviorism, following trial-and-error and mnemonic tasks. At the same time, children are exposed to both the MSA through the Media and to the Qatari dialect spoken at home and in everyday life. Unfortunately, very little research, if any, has reported on the state of the Arab children's vocabulary at the age of five when they start schooling. Saiegh has done few, but very crucial, studies on the effect of diglossia on children's learning (2003, 2004, 2005, 2007). The "scholastic way," which does not go well with new innovative technologies and methods of teaching, actually

makes the students feel far from their actual surroundings.

In this context, the ALADDIN project aims to teach students, by introducing a new comprehensive curriculum based on a communicative approach utilizing listening sessions, narratives, discussion, educational games, and new technologies (i.e., tabletop surface computers) (see Papadopoulos et al., 2013, for more information).

The learning goals for the kindergartner students are to (a) recognize, and (b) produce the letters of the Arabic alphabet. Recognition refers to visual and audio recognition of a letter, while production refers to students' ability to write the letters. The research questions addressed in the paper focus on the latter, analyzing (a) how the affordances of tabletop surface computers alter the learning experience, and (b) the impact of this new technology to students' performance and behavior.

2 BACKGROUND

2.1 The Arabic Language

Arabic is a diglossic language, it has a high form used in all formal contexts (MSA), and a low form used in all daily contexts (Ferguson, 1991). It consists of 28 consonants, 3 long vowels, and 3 short vowels. Short vowels are not written within the

word, but either above or below the letter. Arabic writing has four major characteristics that distinguish it from other languages: (a) writing is from right to left, (b) most letters are connected in both print and handwriting, (c) letters have slightly different forms depending on where they occur in a word, (d) Arabic script consists of two separate “layers” or writing, a basic skeleton made up of consonants and long vowels, and the short vowels and other pronunciation and grammatical markers.

2.2 Surface Computers in Language Learning

The benefits of multimodal tabletop displays for educational applications seem endless. However, few studies have specifically examined the cognitive and pedagogical benefits of multimodal tabletop displays. Finding related literature specifically for early childhood education and language learning was even more challenging. Similarly, a variety of writing apps is available for tablet PCs (e.g., ReadinRockets.org provides a list of the top 9 writing apps). However, literature is still missing on the systematical use of similar applications for tabletops in formal education.

Research reports encouraging results so far. Kerne et al., (2006) discusses the roles for interactive systems enabled by touch screen devices in supporting creative processes and aiding in idea formation. The touch screen devices facilitate the collection and manipulation of images, texts, and voice annotations in a composition space. As documented in Piper (2008), the use of multimodal tabletop displays, as a rich medium for facilitating cooperative learning scenarios, is just emerging. Morris et al., (2005) examined the educational benefits of using a digital table to facilitate foreign language learning. The application allowed four language learners to sit at the tabletop display and cooperatively categorize facts about various Spanish speaking countries.

The horizontal form factor of a multitouch tabletop surface provides a unique opportunity for shared interfaces allowing multiple people to simultaneously interact with the same representation. The use of touch technology was essential in our project, since kindergartners usually lack the ability to use a computer. This, along with the shared interface that would enhance peer interaction, made the use of tabletop surface computers a better choice for our context. One obvious drawback for using this kind of technology is the high cost of the system (especially since we

needed 5 tables to accommodate the whole class). However, one should also consider the fact that this type of technology is gaining ground and it is expected to reach a wider audience and that could also mean a drop in prices. In addition, the ability to transfer part of the material or even have future versions of the project suitable for student-owned tablet computers could also provide argumentation for such a costly solution.

3 METHOD

3.1 Participants

The study was conducted in a private kindergarten school in Qatar. Students were grouped into several classes of, approximately, 20 students. One of these classes was assigned by the school to participate in the project activities, taking into account schedule flexibility, space requirements, and parents’ consent. Our class had 18 Qatari students (9 boys and 9 girls). All students were between 5 and 6 years old and they were enrolled in the ‘Arabic Language’ course. Students were native speakers of the Qatari dialect, but novices in MSA. The goal of the course was to teach students basic linguistic skills in MSA: vocabulary development, letter recognition and writing, and pronunciation. The total population of the class was present only 8 times in the 9 weeks for various reasons (e.g., illness), while most of the times the actual population was 16-17 students.

3.2 Design

The study lasted 9 weeks and during that time the instructional goal was to teach students the standalone form of the Arabic letters. The research design follows an empirical case-study approach. Listening, discussion, writing, and gaming activities were used throughout the semester to complement the introduction of a new letter.

Usually, a new letter was introduced by the teacher during the listening and discussion sessions. Next, the writing activities would follow, and later the educational games. The study utilized observation and system log files to assess students’ performance and attitudes during writing.

3.3 Material

The writing activities were performed in two ways: on paper, and on the surface computers.

3.3.1 Writing Activity on Paper

For the on-paper activity, the students used A4-size sheets. A grid filled with dashed outlines of an Arabic letter was on the each sheet and students had to trace the dashed letter with a black pencil. The students were able to use erasers and the activity was over when the entire sheet was written. This writing activity was considered a closed-type one.

The students were sitting in desks for this activity. The sheets were not part of the new curriculum, but the typical instructional tools used by the school.

3.3.2 Surface Computers

The tabletop surface computers we use in the project (<http://www.samsung.com/us/business/displays/digital-signage/LH40SFWTGC/ZA> - referred in the rest as 'table') have a 40" touch screen that can recognize more than 50 simultaneous touch points making it possible for several students to interact and participate in the same activity. In addition, the size of the screen is large enough to divide the interface in smaller areas and have activities with 4 students per table. The students were standing up around the table while using it.

The technology used by the table is based on infrared detection and not on touch itself, having both pros and cons for our activities. By basing touch detection on shadow recognition, the table was able to interact with tangibles. For example, placing an object on top of a button is similar to pressing the button. On the other hand, relying on infrared resulted in a number of unintentional touches (e.g., loose clothes creating shadows on the table).

3.3.3 Writing Application for Surface Computers

Figure 1 shows the interface of the writing application for the surface computers. The application provides a writing pad to each of the 4 students sitting around the table. Each pad resembles a typical notepad with lines and a white background that contains: a written letter with and without arrows that show the correct way of writing, several outlined letters for the students to trace, and empty space for writing the letters without scaffolding. Writing can be performed either by touching the tabletop directly with a finger, or by using an object like a brush. Either way, we fixed the thickness of the written strokes at 3 pixels for better results and clearer outcome.

Each writing pad comes with five tools: the

writing mode tool that can be used to switch between write/erase mode, the undo tool for erasing the last written stroke, the color picker for selecting the color of writing, and the three lines and the two lines tools to change the number of the lines and the size of the letters appearing in the pad. In the beginning of the curriculum, the teacher may advise students to write letters using the two-line pads, as it would be easier for novice students to write bigger letters.

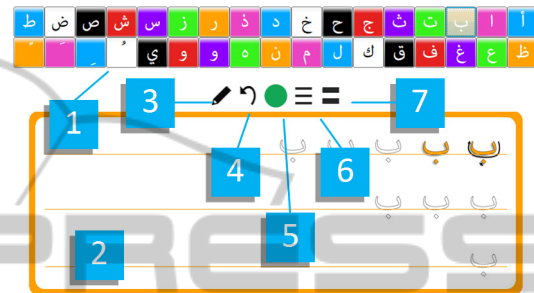


Figure 1: Writing application. 1: Letter bar; 2: Writing pad; 3: Write/erase mode; 4: Undo; 5: Color picker; 6: Three lines; 7: Two lines.

Every time the students select a letter from the letter bar or change the number of lines, the strokes written on the pad are stored in a local image file and the pad is cleared. No personal information is recorded and students' anonymity remains intact. The activity is open-ended and students can keep writing and erasing for as long as they want.

3.4 Procedure

Students have the Arabic Language course four days per week, at different hours. The class typically lasts 40 minutes, however, because students have to switch classrooms between classes and since there is not always a break between classes, the actual duration of the class is usually 30-35 minutes.

Typically, the students were engaged in a writing activity (on paper or on the tables) every time a new letter was introduced. The class was controlled by the school teacher, while the principal investigator of the project was also in the classroom to observe and take notes. Although specific guidelines were provided for each class by the new curriculum, the teacher very often had to adapt the schedule to address, mostly, time issues. Students were supposed to write the letter both on paper and on the tables. However, time limitations dictated skipping one or the other mode for some of the letters.

Students used the writing application on the tables at least once per week, spending

approximately 5-10 minutes for each session. For the first 4 letters, students participated in the on-paper activity before doing the on-table activity. The two different modes were used on different dates. After the fourth letter, the procedure was switched and the on-table activity was performed before the on-paper one. The reason for this was that we wanted to examine whether the order in which the students learn how to write a new letter affects them in any way.

The students were distributed to the 5 available tables in the classroom by the teacher. Although organizing students into groups of 3-4 persons was mostly done randomly, factors such as gender, interpersonal relationships, and general student performance were often taken into account by the teacher, in order to have a balanced distribution. Group formation and students' spots were changing in each class, and, while it was not encouraged, students changing spots during a class was not forbidden either. Since the writing application contained 4 writing pads, each table could support up to 4 students.

We decided to give students paint brushes to write on the tables instead of having them using their fingers. This decision aimed at two things. First, we believed that it would feel more natural for the students to write holding a tool resembling a pencil. Moreover, supporting students' skills in holding a pencil was also a learning goal for the kindergarten. Second, holding a brush for writing diminished significantly the number of accidental touches, since there was now a distance between the table surface and students' forearms.

The use of paint brushes was highly accepted by the students. Specifically, a few weeks into the study we asked students to start writing using their fingers. After a few minutes, the students started asking for the brushes, stating that they prefer writing with them. One should take into account that by that time the students were using the tables for additional activities in the curriculum, apart from writing (e.g., educational games), where they would only use their fingers.

3.5 Data Analysis

To evaluate students' performance and attitudes in the writing activities, we used three sources of data. First, we received photocopies of the paper sheets the students used for the on-paper activity. Students' names were covered to preserve their anonymity. The second source of information was the log files collected from the 5 tables used in the classroom. As

we mentioned earlier, the writing application was capturing students' strokes on the tables producing image files. At the end of the 9 weeks, this massive volume of images was analyzed and compared to the respective paper sheets. Finally, the principal investigator of the project attended every class and took notes throughout the 9 weeks, underlining important events and issues that helped us interpreting the rest of the data.

4 RESULTS

During the 9-week span covered by the study, the students learned the first 12 letters of the Arabic alphabet (from [ا] to [ز], considering 'alif' and 'alif with hamza' two different "letters"). After discarding empty images and scribbles, we collected 752 images from the tables.

Students practiced the writing of the first 4 letters on paper and then on the tables. Results between paper and tables were similar up to that point, with no distinct differences in students' writing or penmanship. In addition, the students were able to familiarize themselves quickly with the tables and minimize unintentional touches.

After the fourth letter, students practiced writing on the tables first and on paper second. What we observed was that after that point students felt more and more comfortable with writing letters. At that point students' behavior in class was increasingly positive as they accepted the various aspects of the new curriculum (e.g., listening sessions, educational games, discussion sessions). However, when it comes specifically on their attitudes towards the writing activity, students' comfort level was evident by two facts, the appearing of drawing and the use of more colors.

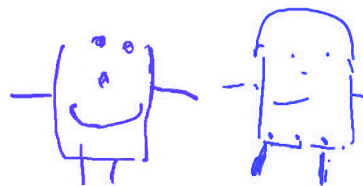


Figure 2: Student drawings on the writing application.

Students started drawing pictures, both on the tables and on the remaining space of the paper sheets after finishing writing the letters. The first pictures appeared in the tables in the fifth letter covered by the new curriculum, the 'thaa' [ث]. Two students used the shape of the letter as the mouth, eyes, and nose of a figurine (Fig. 2).

After that point, the number of drawings increased gradually with more students drawing flowers, hearts, houses, and items that start with the target letter (finding items that start with a specific letter was an important discussion topic during the introduction of a new letter). In the next letter, drawings appeared also on the paper sheets and after that it was a common sight (Fig. 3),

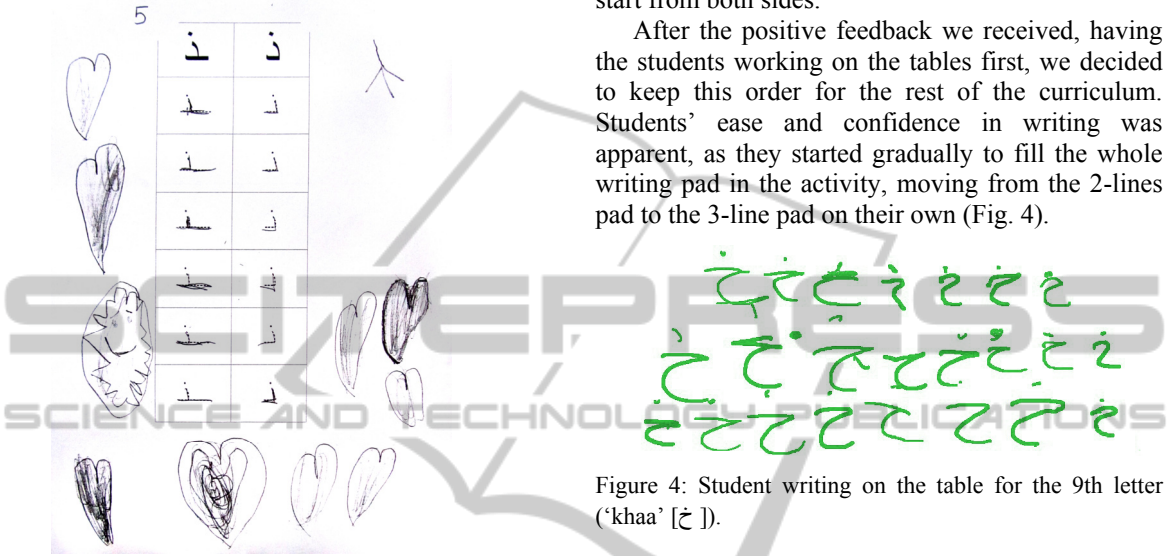


Figure 3: Student drawings on paper sheet for the 10th letter ('dhaal' [ذ]).

At the same time, students working on the tables started using the color picker tool more, thus adding different colors. This action suggests that student were now more engaged in the activity, as they were trying to make their writing more appealing. This option was not available for the on-paper writing, since students had to use pencils.

While writing a letter was an individual activity, when working around the tables, students started collaborating by helping each other adding more colors, erase unwanted strokes, and selecting the right letters to write. The same did not happen during the on-paper writing, since that activity was more structured and closed-type.

One issue we observed was that, in the beginning, students were writing the letters with strokes from left to right. This is usually the preferred way for languages that read from left to right. However, the proper way of writing a letter in Arabic is from right to left and from top to bottom.

English is the primary language of instruction in Qatar (in kindergartner, a student has 1380 minutes of teaching in English and 320 minutes in Arabic, per week). Thus, it was expected that writing would

be affected by the teaching of English. Up until the letter 'jiim' [ج], the students were using the wrong way. However, after that they started writing correctly. A major reason for this, other than repetitive instruction and the arrows that appear next to the letters in the writing pad, was the shape of the letter that forced them to start from the correct side, while the letters up to that point allowed them to start from both sides.

After the positive feedback we received, having the students working on the tables first, we decided to keep this order for the rest of the curriculum. Students' ease and confidence in writing was apparent, as they started gradually to fill the whole writing pad in the activity, moving from the 2-lines pad to the 3-line pad on their own (Fig. 4).

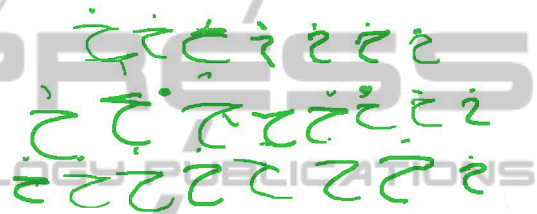


Figure 4: Student writing on the table for the 9th letter ('khaa' [خ]).

Specifically, results showed a few tries with the 3-line pad since the beginning (Fig. 5). However, most of the images showed only unsuccessful efforts, since students were not yet familiar. On the contrary, starting at the 8th letter ('khaa' [خ]), students started using the 3-line pad more often, filling the whole pad most of the times.

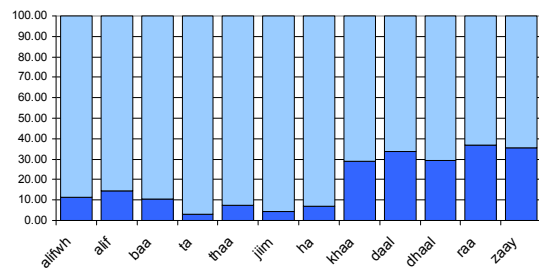


Figure 5: Usage percentage of 2-line (light) and 3-line (dark) pads.

5 DISCUSSION

In general, students developed a very positive attitude towards the project and the writing tasks. Having students practicing on the tables first had a significant effect, as they became more relaxed and

confident. We argue that the characteristics of the tables were responsible for this finding. The open-ended nature of the writing application allowed students to be more creative. Writing was not about tracing dashes on a paper anymore. In addition, the ability to easily erase part, or the whole, of the writing pad with a single touch was a cleaner and easier option than the erasers used on paper, providing also an infinite supply of virtual sheets. Students were not afraid to make a mistake, since it was easy for them to erase it. This also resulted in the high volume of images collected.

The traced letters and the arrows in the writing pad were there to assist students. However, most of the space was left blank. Students did not complain about that. On the contrary, they took the opportunity to write freely. After they changed their attitudes towards writing, they started feeling more comfortable with the paper as well.

Regarding the novelty effect, the tables were, indeed, something new for the students. However, as we mentioned earlier, students of this age are already familiar with touch technologies and their excitement for a technological tool itself does not last long. In other words, students' enthusiasm for the tables was useful in the beginning, but it was not the reason for sustaining a positive attitude throughout the study. More than the technology effect, what the tables did was to change the learning experience for the students. Students were standing up and they could move from one table to the other. Peer interaction and, in some cases, peer collaboration were boosted. We believe that this affected students more than the technology itself in the long run.

In time, students became more confident. The increase of 3-line pads provides evidence on students' performance. However, confidence in students in the study was evident also in other activities of the project. As the teacher noted, students in the project class were more talkative and outgoing than students in other classes. This was of course the result of an instructional design utilizing many different learning activities, with writing being one of them.

We need to clarify that we are not suggesting the complete replacement of the on-paper with a technological one. Holding a pencil and writing on a paper are two essential skills for young learners. Nevertheless, the use of this technology provided us with new opportunities in supporting enthusiasm and engagement, while teaching writing to 5-year-olds.

ACKNOWLEDGEMENTS

This work has been funded by a grant from QNRF (Qatar National Research Fund), NPRP Project 4-1074-5-164 entitled "Advancing Arabic Language learning in Qatar". The authors would like to thank Christos-Panagiotis Papazoglou and Sachin Mousli for their contribution in the developing phase.

REFERENCES

- Ferguson, C. (1991). Epilogue: Diglossia Revisited, *Southwest Journal of Linguistics* 10 (1), 214.
- Ibrahim, Z. (2000). "Myths About Arabic Revisited." *Al-Arabiyya* 33, 13-27.
- Ibrahim, Z. (2008a). *Lexical Separation: A Consequence of Diglossia*, Cambridge University Symposium, Cambridge.
- Ibrahim, Z. (2008b). *Language Teaching and Technology*, in *Linguistics in an Age of Globalization*, editors, Zeinab Ibrahim, Sanaa A. M. Makhlof. Cairo: AUC Press, 1-16.
- Ibrahim, Z. (2009). *Beyond Lexical Variation in Modern Standard Arabic*. London: *Cambridge Scholars Publishing*.
- Kerne, A., Koh, E., Choi, H., Dworaczyk, B., Smith, S., Hill, R. & Albea, J. (2006). Supporting Creative Learning Experience with Compositions of Image and Text Surrogates. In E. Pearson & P. Bohman (Eds.), *Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecommunications 2006*, 2567-2574. Chesapeake, VA: AACE.
- Morris, M.R., Piper, A.M., Cassanego, T., and Winograd, T. (2005). Supporting Cooperative Language Learning: Issues in Interface Design for an Interactive Table. Stanford University Technical Report.
- Papadopoulos, P.M., Karatsolis, A., and Ibrahim, Z. (2013). Learning activities, educational games, and tangibles: Arabic language learning in the ALADDIN project. In *Proceedings of the 17th Panhellenic Conference on Informatics (PCI '13)*. ACM, New York, NY, USA, 98-105.
- Piper, A.M. (2008). Cognitive and Pedagogical Benefits of Multimodal Tabletop Displays. Position paper presented at the Workshop on Shared Interfaces for Learning.
- ReadingRockets.org, Top 9 Writing Apps. Retrieved from: http://www.readingrockets.org/teaching/reading101/writing/literacyapps_writing.
- Saiegh-Haddad, E. (2003). Linguistic distance and initial reading Acquisition: The case of Arabic diglossia. *Applied Psycholinguistics*, 24, 431-451.
- Saiegh-Haddad, E. (2004). The impact of phonemic and lexical distance on the phonological analysis of words and pseudowords in a diglossic context. *Applied Psycholinguistics*, 25, 495-512.

Saiegh-Haddad, E. (2005). Correlates of reading fluency in Arabic: Diglossic and orthographic factors. *Reading and Writing: An Interdisciplinary Journal: An Interdisciplinary Journal*, 18, 559-582.

Saiegh-Haddad, E. (2007). Linguistic constraints on children's ability to isolate phonemes in Arabic. *Applied Psycholinguistics*, 28, 605-625.

