# A PRELIMINARY EVALUATION OF THE TACTUS™ TOUCH TYPING KEYBOARD IN AN AUSTRALIAN ELEMENTARY SCHOOL.

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## ABSTRACT

Touch keyboarding is taught in most Australian elementary schools as part of the Information and Communication Technology (ICT) curriculum. Teachers generally agree that children should receive keyboarding instruction very early. Some teachers even advocate the need to impart keyboarding instruction prior to computer application instruction because they believe that, unless children can touch keyboard before they leave elementary school, they will become comfortable with the "hunt and peck" technique and will never learn to touch type. However, the majority of children leave school with the idea of what touch typing means about but without actually being able to touch type effectively.

This paper reviews the performance of the TACTUS Keyboard, a new computer keyboard which has become available on the Australian market. TACTUS is a standard QWERTY keyboard but certain keys have a ridge on the edge of the key. According to the manufacturer, the ridges significantly facilitate touch keyboarding. Information about the TACTUS keyboard is available on the manufacturer's web site (www.tactuskeyboard.com).

The study involved 25 Year 8 students from Middle Harbour Public School in NSW. One half of the students used computers equipped with the TACTUS keyboard, the other half used computers equipped with a standard IBM keyboard. The study ran for the duration of one term (nine weeks). A timed test, which measured typing speed, was administered to the students at the beginning and at the end of the study. The increase in typing speed, adjusted for accuracy, between the entrance test and the exit test was calculated for each student.

The results show that the improvement in the touch typing skills of the test group, who used the TACTUS keyboard, was greater than the improvement in the control group and the difference was statistically significant.

## KEY WORDS

Computer Keyboard, Touch Keyboarding, Touch Typing, Learning, Elementary schools.

## INTRODUCTION

Computers have become ubiquitous in both businesses and homes. Computers generally require a keyboard for the purpose of inputting data and using the applications.

The most effective way of using the computer keyboard is the method of "touch typing", whereby the user types without looking at the keys, having memorised their location. Because of the pervasiveness of computers, touch typing is an important skill for children to master and is part of the Information and Communication Technology (ICT) curriculum of elementary schools.

However, in spite of touch typing being taught in elementary schools, rarely can teenagers touch type. School leavers may know what the technique means but most cannot touch type. As a result, they end up using the keyboard with the "hunt and peck" technique which becomes a habit and is very difficult to change.

For this reason, some teachers argue that touch typing should be taught to students as early as possible. The benefit of imparting keyboarding instruction at the sixth grade level, prior to computer application instruction, was validated by D. Van Tiem[1] in 1997.

Touch typing is a difficult skill to learn on a computer keyboard, for children and adults as well, for several reasons.

There is the problem of the QWERTY layout, which makes it difficult to memorise the location of the keys and also the fact that the modern keyboard has twice as many keys as the manual typewriter. But, the main reason we believe, is due to the way modern computer applications are designed to be used.

Computer applications require moving the right hand from its "home" position on the keyboard to operate the pointing device (eg., the mouse) or the arrow keys or other function keys. In an experiment using a mouse and a keyboard, Douglas and Mithal[2] found that "homing" time accounted for 28% of the total time spent keyboarding. By contrast, with manual typewriters, the fingers of the typist almost never left their home position during a typing session. The need for very frequent homing breaks the rhythm of the typist and makes learning to touch type more difficult.

Some ICT teachers also believe that learning to touch type is akin to learning to play the piano and therefore would require daily practice. However, in most elementary schools only one hour per week is allocated to ICT tuition.

The fact that school leavers enter the work force without being able to touch type has a huge impact on productivity. We estimate that if all computer users in Australia could touch type, each minute saved would generate a gain of $A1 billion per year. In the United States, the gain would be US$15 billion per year. Therefore, ensuring that children can touch type efficiently upon leaving elementary school, is a desirable objective.

A product that may help teachers achieve this objective is the TACTUS™ Keyboard, which has recently become available (www.tactuskeyboard.com). This keyboard, according to the manufacturer, makes it easier for children (and adults) to learn to touch type. The objective of this paper is to evaluate the TACTUS Keyboard in an Australian elementary school.

## THE TACTUS KEYBOARD

### Product Description

The TACTUS™ Keyboard is a standard QWERTY keyboard. However certain keys, those in a different colour, have special ridges along the edge. The ridges are placed along one edge of a key, as in the key O, or along two edges, in order to form an angle, as in the key P.

The ridges are organised so that they form two virtual "boxes" (highlighted by the darker colour keys in the picture), one formed by the keys Q-R-V-Z in which the left hand moves and a second one formed by the keys U-P-?-M in which the right hand moves. There is also a third box, formed by the keys 1 7 9 3 for the right hand when operating the numerical keypad. The ridges on the keys are engineered to feel like tiny "walls" and to provide to the fingers the feedback of a “wall”.


Each alphabetical box comprises three rows of keys, the home row, that is the row of keys A S D F, where the fingers rest when not typing, the row above it (Q W E R) and the row below it (Z X C V). Each row of the box, comprises four keys, one for each finger.

Depending on where the ridge is located on a key, the ridge communicates to the finger its exact position on the keyboard. For instance, a straight ridge on the top edge of a key, as in the key E, signals to the finger that it is located on the top row of the box. A straight ridge on the bottom edge of the key, as in the key C, signals to the finger that it is located on the bottom row of the box. An angled ridge, as in the key R, signals to the finger that it is located in the corner of a box, in this case in the top right corner of the left box.

Therefore, once the student has learned the location of the keys, touch typing becomes very easy. For instance once the student knows that the key R is located in a corner, it is very easy to feel with the finger because of the two angled ridges.

## STUDY PROTOCOL

### Location and Subjects

The study was conducted at Middle Harbour Primary School in Mosman, NSW, by Ms. Sally Moodie, the ICT teacher, during Term 4 of 2001, which commenced on October 15 and ended on December 20, 2001 (10 weeks).

The students who participated in the study were the Year 8 (second grade) students. At the start of the study, the students had received computing instructions for three terms (30 weeks). In Term 4 (the period of the study) they received computing instructions once a week, for 55 minutes each week.

The class (comprising 25 students) was divided into two groups, a test group which used the TACTUS keyboard and a control group which used the school’s standard keyboard. Entrance and exit tests were administered at the beginning and at the end of the study. The tests measured typing speed in words per minute (wpm).

**Equipment**
The study was performed on PC's equipped with TACTUS keyboards for the test group and on PC's equipped with a standard QWERTY keyboard for the control group. The TACTUS keyboard was installed after the children had completed the entrance test and left in place for the duration of the study. The word processing program used was Microsoft Word™. The touch typing program used was the standard program used by the school (TTAPS™). No changes were made to the ICT curriculum and the students followed the standard curriculum as they would have, had the study not taken place.

**Entrance and Exit Tests**
The entrance test measured the level of typing proficiency of each child (expressed in words per minute) at the beginning of the study and the exit test measured the level of typing proficiency at the end of the study.

The tests consisted of copying several lines of text during a 10-minute[3] testing period. The children started the test at the same time. They were asked to type their name and press the key ENTER, prior to starting the test. This allowed each file to be saved automatically under the name of each child. At the end of the testing period, the children moved away from their desks to allow an assistant to access their computer to save the file. The saved files were printed and analysed for the measurement of the typing speed.

Some simple instructions about the test were given to the children prior to the test; these are listed in the Appendix.

**Measurement of Typing Speed**
The measurement of the typing speed was conducted in accordance with the Australian Standard™ Number 2708-2001 "Keyboarding speed tests". The standard defines, amongst other criteria, format, content, duration of test, warm up passage, paper to be used, pre-reading time, equipment, stroke count, error definition and counting of errors. Candidates are allowed to correct errors and well-executed corrections are not penalised. The Australian Standard offers a protocol for speed and accuracy but certifies only tests that are at least 98% accurate. In our study, we accepted all tests regardless of accuracy and, to take into account accuracy, we calculated a "net speed" by multiplying the "gross speed", by the percent accuracy.

The typing speed was calculated as follows:
a) The total number of keystrokes was counted (after deleting the name of the child) using the File/Properties feature in Microsoft Word™.
b) The total number of keystrokes was divided by 5 to obtain the number of standard words.
c) This number was divided by 10 (the number of minutes allowed for the test) and rounded to one decimal place. The result represents key-boarding the "gross speed" in standard words per minute.
d) The number of errors was calculated.
e) The percent accuracy was calculated.
f) The "net speed" in standard words per minute was calculated by multiplying the gross speed by the percent accuracy.

**Text for Speed Tests**
The text for all typing tests was chosen so that the subjects would be familiar with the words to type but not familiar with the text itself. The test material contained only lower case letters and semicolons and did not contain titles, paragraph breaks or numbers. The text was calibrated against the frequency of letters as they appear in the English language[4]. The passage was typewritten on white A4 paper in font type Courier size 16. The text was organised in lines each containing 40-50 characters per line. The total text comprised approximately 50 standard words.

**RESULTS**
The results of this study can be seen in Table 1. At the exit, the test group typed more words per minute (WPM) than the control group. The typing speed corrected for accuracy for the test group was 2.84 WPM at entrance and 4.71 WPM at exit. This group therefore improved typing speed by 1.77

WPM. The typing speed corrected for accuracy for the control group was 2.50 WPM at entrance and 3.13 WPM at exit. This group improved typing speed by 0.66 WPM.

The increase in words per minute in the test group was significantly different from the increase in the control group at the 95% confidence level.

Of the 11 children in the TACTUS group, 1 did not show any improvement in typing speed at exit. In the control group, 3 out of 9 children did not show any improvement.

**Table 1: Increase in Typing Speed**

| Keyboard | Number of Subjects | Entrance Test WPM | Exit Test WPM | Increase WPM |
|---|---|---|---|---|
| TACTUS | 11 | 2.84 | 4.71 | 1.77 |
| Standard | 9 | 2.50 | 3.13 | 0.66 |

**DISCUSSION OF RESULTS**

This study measured the number of keystrokes typed by children in a determined period of time from a given text. The results indicate that the children who used the TACTUS keyboard were able to type more characters than the children who used a standard keyboard. We hypothesise that this was due to the fact that the children using the TACTUS keyboard did not have to look at the keys as frequently as the children using the standard keyboard.

Because the number of subjects in the study was small, variances in the results were high. A typical elementary school class has 24-26 subjects. In our case, the study started with 25 subjects. However, some students left the school prior to the end of the study, some joined the school during the study and some were not present at the exit test. This reduced the total number of subjects included in the study to 20. The issue of sample size is a problem that other researchers will encounter unless more classes of the same grade are available in the school.

Matching test group and control group is also very important. In our study, matching was done by the ICT teacher who had developed a good understanding of the capability of each child in the preceding three terms. The fact that the mean typing speeds, at entrance, of the test group and the control group were not significantly different, indicates that matching was good. However, because of the impact on the results, a test should be used to measure the ability of each child to absorb instructions as this may influence the ability to learn to use the keyboard.

That the TACTUS Keyboard benefited the children was also anedoctally observed by the ICT teacher. Specifically the teacher noted a reduced rate of “overshoots”, especially of the key A to the key CAPS LOCK. Older children, who also used the keyboard, quickly figured out the purpose of the ridges. In the words of a Year 12 student, the TACTUS Keyboard was easier to use “because one could feel where the pinkies had to go”.

In conclusion, this study showed that children using the TACTUS keyboard achieved a higher typing speed than children using the standard keyboard. While these results are in line with expectations, the small size of the sample does not allow us to make a statement about the amount of improvement. Nevertheless, the study gave us the opportunity to verify a protocol and thus can be of value to other researchers interested in a more quantitative evaluation of the performance of the TACTUS keyboard.

**APPENDIX 1**

**Instructions prior to Typing Speed Test**

1. Run a 5-minute warm session. Ask students to key in the following letters, saying aloud the letters one at a time. Repeat the line at lest five times or until you see that students are comfortable with the typing process.

    a [space] s [space] d [space] f [space] j [space] k [space] l

2. Explain to students how to use the backspace to correct errors.
3. Distribute the test paper (copy sheet).
4. Ask students to look at the copy sheet for 2 minutes.
5. Ask students to maximise word processor.
6. Ask students to type their name and then tap the ENTER key twice.
7. Ask students to copy as much as they can and to correct any errors using the backspace.
8. Tell students never to use the ENTER key.
9. Ask students to start copying from the copy sheet when you say START.
10. After 10 minutes, tell students to STOP typing and get up from their desks.

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**REFERENCES**

[1] Van Tiem, D. et al. (1997). University of Michigan-Dearborn: Keyboarding Skill for Middle School Students.

[2] Douglas, S. A. and Mithal A. K. (1994). The effect of reducing homing time on the speed of a finger-controlled isometric pointing device. Proceedings of the CHI '94 Conference on Human Factors in Computing Systems, 411-416. New York: ACM.

[3] The test period recommended in the Australian Standard is 5 minutes. We used 10 minutes for both the entrance and exit tests to compensate for the low typing speed of the children.

[4] Donald Milliken, Elementary Cryptography and Cryptanalysis, 1942 in U.S. Patent 5,718,590.