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ABSTRACT

Two third grade classes in a private school in North Carolina were given keyboarding instruction using Sunburst's "Type To Learn." So that the effects of color-coding could be examined, one class was given standard keyboards to use (control group), while the other was given keyboards that were color-coded according to proper finger placement (treatment group). Neither class had any previous keyboarding instruction. Before the study, students in both classes typed a paragraph using "Typing Tutor IV." This software measured their speed and accuracy; the mean speed and mean accuracy scores of each were used to determine comparability. During the study, students met twice a week for a 30-minute class. Scores were averaged so that a mean score for speed and a mean score for accuracy from each class could be compared using two tail t tests. Results indicated that implementing keyboarding instruction that uses color-coded keyboards with these students did not appear to improve either keyboarding skills or accuracy. (Contains 34 references.) (Author/AEF)

THE EFFECTS OF COLOR-CODING ON KEYBOARDING INSTRUCTION OF THIRD GRADE STUDENTS

A Research Project

Presented to the

Department of Teacher Education

Johnson Bible College

In Partial Fulfillment

of the Requirement of the Degree

Master of Arts in

Educational Technology and Bible

by

Jane Bruner Wallace

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APPROVAL PAGE

This research project by Jane Bruner Wallace is accepted in its present form by the Department of Teacher Education at Johnson Bible College as satisfying the proposal requirements for the degree Master of Arts in Educational Technology and Bible.

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ABSTRACT

Two third grade classes in a private school in North Carolina were given keyboarding instruction using Sunburst's Type to Learn. One class used standard keyboards, while the other class used keyboards that were color-coded according to proper finger placement to see if it would increase either their keyboarding speed or accuracy. Neither class had any previous keyboarding instruction. Before the study students in both classes typed a paragraph using Typing Tutor IV. This software measured their speed and accuracy. The mean speed and mean accuracy scores of each class were used to determine comparability. During the study the students met twice a week for a thirty-minute class. Students in the control group received keyboarding instruction using standard keyboards while students in the treatment group used the color-coded keyboards during their instruction. The scores from lesson seven were collected for each student. The scores were averaged so a mean score for speed and a mean score for accuracy from each class could be compared using two tail t tests. The study indicated that implementing keyboarding instruction using color-coded keyboards with third grade students, while appearing helpful, actually seemed not to improve either keyboarding speed or accuracy.

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"I am trying to get the hang of this new fangled writing machine, but I am not making a shining success of it. However this is the first attempt I ever have made, and yet I perceive that I shall soon and easily acquire a fine facility in its use. . .One chiefly needs swiftness in banging the keys. . ."

(Mark Twain's first typewritten letter – December 9, 1874

Chapter One

INTRODUCTION

Significance of the Problem

With an advancing use of computers in our everyday lives, both personally and educationally, students are using keyboards at a much younger age than before. There appears to be a need for a formal instruction of keyboarding earlier to ensure proper technique for greater advantage in future utilization. Students who develop their own system of typing often establish poor habits that are inefficient and will later be difficult to correct. Frequently valuable educational time is lost when students rely on the "hunt and peck" method of typing. As educators, we need to be concerned with teaching students to use computers both effectively and efficiently.

Keyboarding is a building process, which teaches students to use the touch system of typing and memorization of specific fingering for specific keys. Beginning with the 'home row' keys (a,s,d,f,j,k,l,;), students practice striking the keys while maintaining attention to the text. As keys are introduced and practiced, additional keys and fingering techniques are introduced and practiced.

Statement of the Problem

Computer assisted instructional (CAI) software has added renewed interest and excitement into previously dry instruction of keyboarding. Earlier, keyboarding was taught by business teachers in the high school. Now, with the assistance of computer software, elementary school teachers with little typing experience can introduce their students to keyboarding.

There are numerous software titles available for keyboarding instruction. They include similar aspects which developers provide to motivate and instruct students: animated demonstrations, verbal instructions, color graphics, immediate evaluation and feedback, positive reinforcement, learning games, and measures of speed and accuracy. These programs may prove especially effective for elementary students who need more concrete approaches to learning.

Using color-codes to assist in keyboarding instruction may further benefit students learning proper fingering and memorization of keys. This study will examine that possibility with a comparison of one group of students receiving computer keyboarding instruction with the assistance of color-codes and one group without the color-codes.

Definition of Terms

Color-coding is the application of color to a particular task in order to provide meaningful value. "A code is defined as a method of structuring perceptual and associative information for the purpose of facilitating learning, retention, and recall" (Dwyer and Lamberski, p. 312). It "enables learners to organize and/or categorize stimuli into meaning patterns which enables them to interpret and adjust to their environment" (Dwyer and Lamberski, p. 309).

Keyboarding

> (I)s the term used to describe the activity of entering information on electronic equipment through the use of a typewriter-like keyboard. Keyboarding is the skill that enables an individual to use a computer terminal or microcomputer efficiently (Kisner, 1984, p. 21).

Keyboarding is a cumulative skill, which requires learners to become successful at one level before proceeding to the next. Students then use the keyboard for basic data input.

Limitations of the Study

1. Since the subjects are all from one private school, it is unlikely that they represented a random group of third grade students in the United States.

2. There is a higher expectation of academic achievement combined with the factor of tuition for every student therefore presenting the possibility of a greater than normal number of higher socio-economic students with average or higher ability and previous computer experience.

3. The small sample size will make generalizations of the study difficult.

Null Hypotheses

1. Students receiving keyboarding instruction combined with keyboard color-coding will have no significant increase in speed measured in words per minutes over students receiving only keyboarding instruction, at the .05 level of significance.

2. Students receiving keyboarding instruction combined with keyboard color-coding will have no significant increase in accuracy over students receiving only keyboarding instruction, at the .05 level of significance.

Chapter Two

REVIEW OF RELATED LITERATURE

The Need for Keyboarding Instruction

With the growing number of computers in the classroom, many students are given the opportunity to utilize this resource at an earlier age (Hoot, p.96; Jackson, p. 8; Peterson, p.1; Pohl, p. 16). A growing number of students have access to computers at home. Therefore, students begin using the keyboard before learning proper keyboarding techniques (Binderup, p. 31; National Business Education Association, p. 1).

Many early keyboarding students who develop their own system of typing acquire bad habits that are inefficient and often hard to break (Behymer, p. 30; Koorland, p. 13; Pohl, p. 16; Tenney, p. 216). Students begin typing with two fingers and looking at the keyboard as they type. Students also lose valuable instruction time trying to find the proper keys (Kisner, p. 21). While many schools have implemented keyboarding into their curriculum, there is still a significant number that have not yet done so (Sormunen, 1990, p. 170). Sormunen summed it up well when she stated that

> effective use of the microcomputer keyboard must be developed early if students and teachers are to gain the tremendous benefits this tool can provide in accomplishing educational objectives (Sormunen, 1990, p. 158).

The Appropriate Age to Begin Keyboarding

The appropriate age to begin instruction is greatly debated (Koorland, p. 13). While some question whether early elementary students have the physical capability to type efficiently (National Business Education Association, p. 3), or can retain what they have learned without constant practice (National Business Education Association, p. 44),

there is research that indicates students should begin keyboarding instruction around third grade (Jackson, p.8; National Business Education Association, p. 3; Kercher, p. 2; King and Alloway, p. 48; Tenney, p.226). Hoot (p. 100) even suggests that children as young as kindergartners, "can develop speed and accuracy with touch typing by using typing tutor software programs."

A study was conducted by Behymer and Echternacht comparing the results of keyboarding instruction of second and third grade students. The purpose of the study was to determine if there was "a significant difference between the level of keyboarding competency." Gender results were also examined. The instruction was provided after school on a volunteer basis because regular class time could not be used. The subjects included 42-second grade students and 38 third grade students. Microtype, the Wonderful World of PAWS, a computer assisted instructional (CAI) software was used for the instruction, which was given in twelve thirty-minute periods. Following the instruction, students were given three one-minute timed writings. Based on the results, which were analyzed using a three-way analysis of variance, the researchers determined that

> third grade students, in general, demonstrated higher ability in comprehending the verbal instructions and had a greater interest in learning to keyboard by "touch" (Behymer, p. 32).

Students at this age appear to have reached the physiological development needed to be proficient keyboarders (Jackson, p. 8; National Business Education Association, p. 3). In a study conducted by King and Alloway (1993) there was indication that

elementary students used the keyboard more efficiently than preschoolers did, although the preschoolers preferred to use the keyboard more than the elementary students. Yet the older students may have developed a "genuine appreciation for the device that assists them in the most expeditious executions of tasks" (King, p. 50).

While the efficiency of instruction does appear to increase with age (National Business Education Association, p. 44), in a study conducted by Sormunen comparing the speed achievement of students in grades three through six no significant difference was found (Sormunen, 1988, p. 55).

Suggested Length of Lessons for Third Grade Students

Elementary students appear to benefit best from keyboarding classes which last from twenty to thirty minute periods which meet daily (Behymer, p. 31; Jackson, p. 10; National Business Education Association, p. 5). This block of time would allow students to spend an adequate amount of focused learning on task and would add retention of previous lessons taught.

The Benefits of Keyboarding in other Subjects

There appears to be a correlation of keyboarding instruction and achievement in other subjects (Hoot, p. 96). Summarizing other literature, Sormunen draws three conclusions concerning the advantage of teaching elementary students to type:

> (a) improved attitude toward schoolwork, (b) progress in reading for all, but especially for children in the lower ranges of intelligence, and (c) generation of longer and more comprehensive reports. (Sormunen, 1988, p. 47).

Reading ability does appear to be related to learning keyboarding (Tenney, p. 223). Results of this study indicated that "the more highly skilled the student was in

reading, the more likely the student was to increase typing speed and accuracy as a result of the instruction." There is improvement observed in the areas of creative writing (Pohl, p. 18), spelling, reading and handwriting (National Business Education Association, p.2, 6).

Keyboarding instruction is also beneficial in helping students to become independent learners and "able to concentrate more on concepts, and they develop skills more easily than students who have not acquired keyboarding skills do" (National Business Education Association, p. 1).

The Role of the Teacher in Keyboarding Instruction

While the computer assisted instructional (CAI) software does teach students, the role of the teacher in the learning process still needs to be investigated (Nichols, p. 16; Tenney, p. 225). It has been suggested that a combination of CAI software for keyboarding and a keyboarding textbook with "coordinated lessons provide the most desirable instructional media" (Jackson, p. 10; National Business Education Association, p. 22).

Several studies have been done to determine what importance a teacher plays in the learning process. Nichols (1995) provided two different types of keyboarding instruction to students in grades three, four, five and six during a yearlong study. One set of subjects received keyboarding instruction with the Diana King Method which is teacher intensive. The other set of students received instruction using Type to Learn which allows the software to do the teaching. The purpose of this study was to determine the best method of keyboarding instruction to improve both speed and accuracy.

Following the study, it was found that students who learned keyboarding using the Type to Learn approach produced typing speeds that were significantly greater than the students in the Diana King Method group. Yet students receiving the Diana King instruction made significantly fewer errors than the Type to Learn students.

Tenney and Osguthorpe (1990) conducted a study that compared the effectiveness of tutor-assisted and self-directed computer-aided instruction to develop keyboarding skills. Learning disabled students who received keyboarding instruction from a software program both independently and with a tutor showed no significant difference in their performance. This research also found that some students had trouble developing skills under constant observation.

Computer software encourages the students to remain on task and frees the teacher to spend more time monitoring progess. In the examination of the design process of educational software it was determined that creating more independent learners using computer software might make interaction with the teacher more beneficial. The software would provide feedback to the student and allow the teacher to spend more time monitoring student progress (Stern, p.60).

Using computer software allows the students to work as their own pace (Darty, p.26). The teacher is able to monitor progress of each students while allowing each child to spend as much time as required on individual lessons. Students are able to review problem areas independently.

Research seems to suggest that the teacher still plays an essential part of keyboarding instruction and that role may influence the performance of the student (Pohl,

p. 18). It is important for the teacher to monitor the progress of the student by observing their posture, fingering, and hand position (Sormunen, 1986, p. 75; Tenney, p. 225).

Type to Learn

Sunburst Communications distributes Type to Learn, a software program that teaches keyboarding. This software provides instruction using animated demonstrations, verbal instructions, color graphics, immediate evaluation and feedback, positive reinforcement, learning games, and measures of speed and accuracy. It is recommended for students ages eight to fourteen. Students learn proper keyboarding techniques through four different activities: lessons, games, word processing and speed drills. In addition to keyboarding instruction, Type to Learn "strengthens language skills by teaching spelling patterns, synonyms, antonyms, and important writing conventions such as capitalization and punctuation" (Holzberg, p. 24).

The Use of Color in Education

There has been substantial research done in the area of color and learning. While some have found that color does not always result in improved learning (Dwyer, 1982, p. 304; Pett, p. 24; Steinberg, p. 3), it does appear to have benefits on attention (Pett, p. 25; Steinberg, p. 3), for locating important information (Pett, p. 26; Steinberg, p. 3), organizing information (Dwyer, 1982, p. 309), distinguishing between information (Steinberg, p.4), independence (Kajs, p. 109) and increasing retention (Pett, p. 30).

Research has shown that color coding helps learners organize or categorize information into useful patterns which enables them to interpret and adjust more readily to their environment (Dwyer, 1998, p. 244)

Using color-codes for related or paired items seem to be especially productive (Steinberg, p. 4). It is important to limit the number of color-codes used. Up to four or five colors-codes seems to remain advantageous (Pett, p. 26; Steinberg, p. 5). Although "caution is recommended in selecting the number of cues to be color-coded. As the number of color-coded cues increases, the value of color coding decreases (Steinberg, p. 4)."

Color and Keyboarding Instruction

Color has been shown to be a useful tool in instruction and recall of educational material (Dwyer, 1982, p. 317; Pett, p. 30; Pruisner,1993a, p. 31; Pruisner, 1993b, p. 158; Steinberg, p.3). Using color-codes with the instruction of keyboarding may be a valuable tool in helping students become efficient typists. Several studies have already used color in relation to keyboarding instruction (Binderup, p. 31; Kaja, p. 108; Peterson, p. 4; Pohl, p. 16; Tenney, p. 224). Early educators used aids to help students memorize key fingering, such as rings with picture associations (Burke, p.18). Summarizing their study on the use of color in the teaching-learning process (Dwyer, 1982 p. 317), this conclusion was reached: "color codes have been found to facilitate achievement in complex cognitive self-paced tasks, particularly with criterion tasks that are visual in nature."

Color in Music Education

A comparable study was done with color-coding and teaching music reading to beginning instrumental students in the elementary grades (Rogers, p. 64). While the instruments themselves were not coded, the musical notes in the textbooks were. The color-coded notation was used as a pedagogical aid for beginners. Fifth and sixth grade

students from two different schools were given instrumental instruction 45 minutes daily for a period of twelve weeks. Findings there indicated that the color-coded notation did not enhance achievement. Following the instruction, it appeared that some students in the treatment group had become dependent on the color-codes.

Conclusion

Children are using computers at a much earlier age than before. It is necessary to begin keyboarding instruction early to prevent the development of bad habits that will later be difficult to break. Research has indicated that students around the third grade have developed enough physically to begin formal keyboarding instruction. Instuctional periods should last about twenty to thirty minutes in length.

In addition to computer curriculum, keyboarding has also been shown to be advantageous in other curriculum areas. Students are highly motivated by computers and have shown improvement in curriculum areas such as reading, creative writing, spelling and handwriting. Students become more independent learners.

Using computer assisted instructional software helps students progress at their own speed allowing the teacher to focus more individualized attention on students in need. The software also encourages student to remain focused and on task giving them opportunity to review trouble areas at their own pace.

Using color in education has been widely researched. Color-codes appear to be useful in locating and retaining information. Instructional aids have been used in the past in teaching keyboarding and found to increase success in some instances. Further research is necessary in this area.

Chapter Three

METHODS AND PROCEDURES

Subjects

This study was conducted at a private Christian school in North Carolina. Two third grade classes were selected to observe during the study. At the beginning of the school year the total school population, grades kindergarten through eighth, was 251. Students were primarily from an urban environment. Most students had two parents who worked full-time. A large number of parents attended college. Approximately ten percent of the student population of the school was minority. That percentage was consistent in the third grade. All students attending the school were charged tuition. Most of the students attended the school since kindergarten and before as part of the school's preschool program. The preschool and kindergarten programs were academically focused. The achievement level of the total school population was above average. Students from the classes selected to participate in the study had not received any formal keyboarding instruction before the study. They had met the previous year for computer instruction once a week for a thirty-minute class and during the start of the current year for two thirty minutes classes each week.

Subject Selection

The administrator heterogeneously assigned the students to their classes during the summer preceding the study. This assignment was assumed to be random within the school population. Each third grade class began the study with sixteen students. One student from the class receiving the treatment withdrew during the study.

Pretest

Before the treatment began, both classes took a typing test using "Typing Tutor" software. Each student typed the same paragraph consisting of six sentences. This test was performed on an IBM compatible computer. The test measured both the speed and accuracy of each student. Individual scores of students in each class were averaged so that a mean score of speed and a mean score of accuracy could be determined for each group of students. The two mean scores of speed and the two mean scores of accuracy were used to determine the comparability of the two groups.

Experimental Method

The control group and treatment group received the same introduction to keyboarding. Both classes received similar instruction using "Type to Learn" software during the treatment. This software is distributed by Sunburst and is designed primarily for the instruction of keyboarding. It has culminating lessons, which introduces keys, teaches specific fingering for specific keys, practices stroking the keys, reviews previous lessons and provides games to practice keys introduced. In addition to the software, students in the treatment group used keyboards that were color-coded. A set of keyboards was labeled with four different colors representing the four different fingers used for the keys on the home row and additional keys. Colored reinforcements were placed on the keys with the letter of the key visible through the center. While the top of the key was coded, the letter or symbol was not covered so that it was still visible to the students. Although it is important that students learn to type while not looking at the keyboard, covering the letter or symbol for the treatment group may have influenced the

performance of the typist and therefore, the results of the study. The keys were coded as they were introduced.

The control group, which did not use the color codes, met first. This group used the computer software to work through the lessons. The teacher introduced the keyboard and proper techniques. As the programs were opened, the teacher determined that each student opened the correct file. While the students were typing, the teacher circled the room to observe and monitor progress, correcting as needed. After a thirty-minute session, the students closed their file.

The treatment group, using the color-coded keyboards, began immediately following the control group. Before they began the teacher switched the keyboards by exchanging a standard keyboard with the color-coded one. The teacher again introduced the keyboard and proper techniques. The teacher determined that each student opened the correct file. As the students were typing, the teacher circled the room to observe and monitor progress, correcting as needed.

As a key was introduced, a small sticker corresponding to the color of the key was placed on the nail of the finger used to strike the key. These stickers were mandatory when the letters were introduced and available as the lessons were reinforced. After a thirty-minute session, the students closed their file.

As the students in both classes progressed through the lessons, the software recorded both their speed and accuracy measuring their performance. Students remained at the same computer for the entire treatment so a record of their progress was maintained accurately. Only the scores from the final lesson will be used for this study.

Study Timeline

The study took place over a period of eight weeks. Students received two thirty-minute classes of keyboarding each week unless the school was not in session during a scheduled class. Scores were collected and compared after each student completed ten lessons; although some students were allowed to stop after lesson seven. Because this program allowed students to progress through the lessons at their own pace, students who were absent during the treatment could complete the lessons and still use their scores for the study.

Experimental Factors

The experimental factor in the study was the inclusion of color-coding on the keyboard. The treatment group used keyboards that were color-coded for specific fingering. The control group used standard keyboards during the treatment period. Each group received the same instruction.

Statistics

As with the test at the beginning of the study, individual scores of the students in each group were averaged to find each group's mean score of speed and mean score of accuracy. Those mean scores were compared by t-scores to determine if there was a significant difference in the scores between the control group and the treatment group at the .05 level of significance.

Chapter Four

RESULTS

The Type to Learn software measures accuracy beginning with lesson one. Upon completion of lesson seven and each additional lesson a words per minute (wpm) score is calculated and recorded. The final scores of students in both classes were gathered from lesson seven. The data collected included two dependent variables, speed (measured as words per minute) and accuracy (expressed as a percentage correct). Separate analyses were performed on each variable. The data were analyzed by comparing the mean scores using a two tail t test.

Keyboarding Speed

After treatment, the two groups were compared by obtaining a t-score. There was no significant difference in their scores (See Table 1). Hypothesis 1 stated that students receiving keyboarding instruction with keyboard color-coding would have no significant increase in speed measured in words per minutes over students receiving only keyboarding instruction at the .05 level of significance. This hypothesis was retained at the .05 level of significance.

Table 1

Keyboarding Speeds - Words Per Minute (wpm)

Groups	N	Mean	Mean Difference	Std. Error of Means	t-ratio	Sig. 2-tailed
Treatment	15	12.47				
			-.2208	.4680	-.472	.641 *
Control	16	12.68				

*Not Significant

Keyboarding Accuracy

After treatment, the groups were compared by obtaining a t-score. There was no significant difference in their scores (See Table 2). Hypothesis 2 stated that students receiving keyboarding instruction with keyboard color-coding would have no significant increase in accuracy over students receiving only keyboarding instruction at the .05 level of significance. This hypothesis was retained at the .05 level of significance.

Table 2

Keyboarding Accuracy – Percent Correct

Groups	N	Mean	Mean Difference	Std. Error of Means	t-ratio	Sig. 2-tailed
Treatment	15	97.20				
			.3875	.7152	.542	.592 *
Control	16	96.81				

*Not Significant

Chapter Five

SUMMARY, CONCLUSION, RECOMMENDATIONS

Summary

Two third grade classes in a private school in North Carolina were given keyboarding instruction using Sunburst's Type to Learn. One class used standard keyboards, while the other class used keyboards that were color-coded according to proper finger placement to see if it would increase either their keyboarding speed or accuracy. Neither class had any previous keyboarding instruction. Before the study students in both classes typed a paragraph using Typing Tutor IV. This software measured their speed and accuracy. The mean speed and mean accuracy scores of each class were used to determine comparability. During the study the students met twice a week for a thirty-minute class. Students in the control group received keyboarding instruction using standard keyboards while students in the treatment group used the color-coded keyboards during their instruction. The scores from lesson seven were collected for each student. The scores were averaged so a mean score for speed and a mean score for accuracy from each class could be compared using two tail t tests.

Conclusions

The results suggest that color-coding keyboarding instruction was not significantly superior to instruction with standard keyboards with regard to keyboarding speed and accuracy. Little difference was obvious in either the speed or accuracy of either class. Although students receiving the treatment began the study typing slightly

faster, their mean speed was actually slightly slower than the control group's mean score at the conclusion of the study. The treatment group's mean score of accuracy was slightly higher at the beginning of the study and remained higher throughout the study although a comparison of the two final mean scores did not measure a significant difference.

It is possible that the students using the keyboards with color-codes and those using standard keyboards performed comparably because of the limited number of keys introduced. Initially, the students were expected to complete ten lessons. While most of the students accomplished this goal, several students from each class had difficulty successfully completing some lessons. The Type to Learn software sets expected goals of speed and accuracy requiring each student to meet them before completing each lesson. Some students grew frustrated when they were unable to meet the preset goals. As a result, it was decided to compare the mean scores after lesson seven rather than lesson ten. Allowing the students to stop might prevent the development of a potentially poor attitude toward keyboarding, which might affect future instruction.

Recommendations

This study had several other limitations that should be mentioned. One included the sample size. Although two third grade classes were used in this study, each class began the study with only sixteen students. One student from the treatment group withdrew during the study. It would be helpful to duplicate this experiment using a larger sample size.

Another limitation might include the age of the subjects. Although these two third grade classes made satisfactory progress in keyboarding skills, the results may have been significantly different if they had been able to progress farther in the lessons. Because of the inability of several students to complete some lessons successfully, a limited number of keys were introduced. This may have affected the results of the study. Introducing more keys may have allowed the utilization of color-coding to be more effective in both speed and accuracy. Repeating this experiment with students in higher grades may result in a significant difference in scores.

Further studies might include adding a keyboard skin on all keyboards, which would prevent students from viewing the letters of the keys and forcing students to rely on memorization.

Implementing keyboarding instruction using color-coded keyboards with third grade students, while appearing helpful, actually seemed to make no difference in improving either keyboarding speed or accuracy.

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APPENDICES

APPENDIX A

TYPING PRE-TEST

Typing Tutor IV

When I wake up in the morning I like to get right out of bed. I run to the window to see what the weather is like. Some days the sun is shining very brightly. On other days it is hiding behind the clouds. When it rains the clouds are very dark. My favorite days are snowy days because then I can go back to bed.

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