Literary Unified English Braille Code versus Standard Braille: A Pilot Study Comparing Experienced Braille Readers' Reading Rates, Miscues, and Regressions

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Introduction

As the International Council on English Braille (ICEB) strives to coordinate a standard code to be used by readers in English speaking countries, the acceptance of a Unified English Braille Code (UEBC) has been slow to catch on in the United States. Although it has been more than a decade in the works, the attempt to unify traditional literary braille, used in English speaking countries around the world, with the technical and math codes that are currently authorized by the Braille Authority of North America (BANA) and the Braille Authority of the United Kingdom (BAUK), has been slowed by practical concerns within the field. Namely, many invested parties have shown reluctance to embrace the UEBC because of fears that the new code will be so radically removed from EBAE that it will be much more difficult to read.

It has been a high priority of BANA to merge the Nemeth and Computer Braille Codes (CBC) with standard literary braille such that few major changes are seen in the literary code. Many of the changes that would affect literary code are de-contractions, designed to eliminate redundant dot patterns that would occur as a result of the merging. Other changes are designed to unify symbols, where more than one symbol may converge from the various codes. For example, the dollar sign which has three different symbols in literary, Nemeth, and CBC codes would be unified into one symbol in UEBC. Despite BANA's best intentions to create a braille with the "same clarity and expressive scope" of other writing systems (International Council on English Braille, 2003), concerns have risen in the field about the transferability of standard braille skills to the new braille code. Whereas many of the changes that are proposed take up more cell space and may require readers to learn new symbols, concerns arise about how the "de-contracted" and unfamiliar dot patterns will spawn unwieldy literary volumes, that will take longer and be more difficult to read (Jackson & Bogart, 1993).

These concerns are paramount to American braille readers, teachers, transcribers, and publishers who are eager to see that the current body of available braille materials does not become obsolete with the adoption of the new code. Furthermore, it is important that the proposed changes to EBAE code do not change standard literary braille so much that readers' skills are made obsolete. Issues similar to these have been poignantly addressed in the literature (e.g., Jackson & Bogart, 1993), as well as in papers presented at various meetings of the ICEB. These papers which thoroughly describe the structure of the UEBC, and provide specific rationale for the changes that UEBC proposes, are available to read on the ICEB website.

A strong case is made by supporters of UEBC for unifying the codes that are now authorized by BANA. Cranmer and Nemeth (1991) suggested that one reason for the steady decline of braille use among children and adults is the complexity that multiple disjointed codes foster. A fragmented braille system, they argued, is archaic, and places blind people at a disadvantage as they interact in today's better integrated society. For blind readers to function maximally in schools, jobs, and leisure activities, the rich and variable content of brailled textbooks, technical manuals, and literature would be consistent and unambiguous. Spungin (2003) echoes this call for unification, labeling the reluctance to accept UEBC as "self-destructive" to the field. Students who must continually change from one code to another face a disadvantage among sighted peers who use one set of symbols for many domains.

Despite arguments for and against the adoption of UEBC, there is currently a dearth of empirical data that directly tests the effects of UEBC changes on the reading behavior of current EBAE readers. The purpose of our pilot experiment was to gather data that could begin to fill this void. We have tried to demonstrate the impact that UEBC changes will have on experienced braille readers in relation to their reading rates, miscues, and regressions. Specifically, we wanted to know whether the changes proposed in UEBC will significantly decrease reading rates among experienced braille readers. And if so, then what is the relationship between oral miscues and regression rates as they affect UEBC reading rates?

Method

Participants

Our sample was made up of 8 adult EBAE readers from medium sized urban communities within Mississippi and Alabama. Six of our participants were female. Five of the 8 readers were congenitally blind; however, of the 3 later-blind participants, only one had experience with reading print materials prior to becoming a braille reader. During recruitment for this project, participants were interviewed about their previous exposure to UEBC, and whether they held attitudes about UEBC that could be reflected positively or negatively in our results. All participants reported no previous exposure to or biases for or against UEBC changes. Only 3 of our 8 participants had heard of UEBC prior to their involvement in our study. All of our participants were well educated (M = 17.0 years, SD = 2.6), and were highly experienced at using braille as a means for reading text information. Our readers were older (M = 49.7, SD = 8.2) and their experience reading braille ranged from 34 to 61 years (M = 44.0, SD = 8.5). All participants reported using braille regularly in their jobs and/or school work, and each self-rated his/her reading skills as either “good” or “excellent”. All participants were volunteers, and no inducements were offered for their participation.

Equipment

During each session (both pre-test and post-test) participants read 3 two-page passages that were adapted from the comprehension section of the Nelson-Denny Reading Test (Forms G and H, respectively). Passages were brailled onto 8 ¾” x 11 ¼” transparent sheets. A maximum width of 32 cells per line was maintained, and no sheet contained more than 27 lines per page. We used passages from Form G, brailled in EBAE as stimuli for the initial pre-test sessions. On average, each page from Form G (of 6) contained 502 readable cells (including spaces), and 103 words. Passages from Form H (used in our post-test sessions) were brailled into UEBC using Duxbury translation software. On average, each page from Form H (of 6) contained 539 readable cells (including spaces), and 108 words. Of the readable cells, a mean of 18 cells per page (4%) reflected UEBC changes.

Braille dots were “blackened” from beneath using a permanent ink marker so that the braille could be clearly seen through the transparency. Four small pieces of Velcro were affixed to the corners of each transparency to keep the sheets from sliding around on the reading surface, and to assure that transparencies were placed consistently beneath the view finder of the video camera.

Participants were seated on a 24 inch tall stool facing a portable adjustable table. When the table was too high or too low for the participant to read comfortably in a “normal reading position” on its flat surface, the table was either lowered or raised until the participant was comfortable with its height. The surface of the table was made of clear plastic glass overlaying a white surface. The white surface functioned to contrast against the black braille dots, making the contents of each braille cell clearly visible to a video camera positioned above the braille.

A Canon Optura Pi Mini-DV camera, mounted on a tri-pod, was positioned directly in front of the reading surface, facing the reader, approximately twelve inches above the braille materials. We used the camera to create an audio/video record of each participant reading passages orally. Taped recordings were then transferred to a digital format, which were used during the analysis of the data. Audio-videos were used to derive data pertaining to finger movements (regressions), to locate and mark oral reading miscues, and to measure the reading rates of our participants.

Instruments

Nelson-Denny Reading Test (NDRT): In its original format, the NDRT is used to assess reading ability and reading speed among high school and college-level print readers. Two timed subtests are administered to provide scores reflecting vocabulary and comprehension skills. We did not use the vocabulary subtest of the NDRT in our study. We adapted and used the latest revisions (Alternate Forms G and H) of the comprehension section of the NDRT to assess our variables of interest (i.e., regressions, miscues, and reading speed). All of our stimulus passages were derived directly from the comprehension subtest (See Appendix D). Short passages of the NDRT's comprehension section are drawn from the most recent and most widely-used texts, at both high school and college levels. Topics depicted in the passages relate to the humanities, the social sciences, and the hard sciences. Alternate Forms G and H were normalized and equated by the test's publisher, and summary statistics for item difficulty are comparable across grades 9 thru 16.

BANA UEBC Sampler 1 (April 2001): This sampler was prepared by the Braille Authority of North America, and was designed and distributed to give UEBC exposure to braille readers, educators, and braille producers, in order that they may assess the new braille themselves. It contains a description of the changes to EBAE, Nemeth, and CBC, and provides sample readings that utilize the new and changed symbols. Sample readings include a recipe, scientific articles on tidal energy and condensation, several examples of magazine advertisements, excerpts from a novel, and a specially-composed story that summarizes and reiterates the symbols utilized earlier in the sampler. We provided the entire sampler to our participants as training in the UEBC. We advised them that their primary focus should be on the new and changed literary symbols.

Procedure

In order to assay our participants' ability to transfer their standard literary braille skills toward reading UEBC, we utilized a within-subjects, pre-test/post-test design, which was conducted during two 45 minute sessions per subject. Each experimental session was conducted within the participant's home or office. Although it would have been preferable to test all participants in one central location, and within a single controlled setting, because of the relative dearth and wide dispersion of available Braille readers in the area from which we drew our sample, we traveled to each participant's home or office for the sake of convenience for individuals in our sample group. Although locales differed, we *were* able to assure that each individual participant was tested in the same quiet setting during both of the pre-test and post-test sessions, and that the same apparatus (described above) was used to test each participant across both sessions.

Prior to beginning the first session, participants read and signed a consent form that described the experiment, and advised them of their rights as participants in the study. In brief, our consent form stated that participation was voluntary, that the risks of participating were minimal, and that participation could be discontinued at any time and for any reason without penalty (See Appendix C for complete form). Mississippi State University requires that all studies involving human subjects be approved by an Institutional Review Board (IRB) made up of an appropriate University review committee. This committee, appointed by the Vice President for Research, is comprised of volunteers from Mississippi State's faculty and staff and at least one member of the community. All of the materials used in this experiment were reviewed and approved by this board. The IRB is responsible to ensure that all research conducted is compliant with ethical standards, Mississippi State University policy, and federal regulations.

In the first of two 45 minute sessions, participants were instructed that they should read 3 passages orally from the Nelson-Denny Reading Test (G Form). All passages during this initial session were brailled in EBAE format. Participants were asked to orient themselves on the first word of each passage, and were instructed when to begin reading aloud. As participants read, we recorded their finger movements, and their voices.

Following the reading portion of the testing, participants were given an instructional booklet containing a brief description of the UEBC rules, and several examples of passages that utilized the new code. We asked participants to familiarize themselves with the changes contained in the new code, and to practice reading the UEBC passages. Over the next four weeks, we contacted the participants weekly to confirm that they were reading from the booklet, and to answer any questions that they had pertaining to the structure of the new braille code.

After four weeks, we used the same methods described above to administer the post-test portion of the experiment. Participants were instructed that they should read 3 passages from the Nelson-Denny Reading Test (Form H). This time, however, the passages were brailled in UEBC format. Again, we made audio/video recordings of each participant's finger movements and voice, to be analyzed for regressions, miscues, and reading rate. Following the reading task, we administered a brief questionnaire to acquire information pertaining to degree of braille-reading experience, education level, onset of vision loss, and a series of open-ended questions relating the participants' subjective feeling about UEBC (see Appendices A and B).

For both pre and post sessions, reading times were calculated in seconds using the timer that was built into the video camera. We began timing when the reader spoke the first word of the passage, and stopped after the reader spoke the last word. Although "word per minute" measures are sometimes criticized because the rates can vary depending on the difficulty of the text (Millar, 1997), we used this measure in our analyses because we were interested in comparing the readers relative to themselves—not against braille readers on the average.

Items were considered to be miscues when participants added or omitted words, substituted incorrect words for the text contained in the passage (e.g., "specific" for "species"), or reorganized a sequence of words. Items were also scored as miscues when participants changed any part of a word as it appeared in the text (e.g. "varied" for "varying"). In short, we tallied a miscue, when the reader's oral rendition did not match the text verbatim (definition adapted from Weaver, 2002). Oral miscues were scored as UEBC miscues when they occurred at a place in the text where UEBC changes had been applied.

Regressions were scored any time that the reader's leading hand retraced previously scanned text. We scored a regression whenever forward motion of the leading hand stopped for the sake of rereading cells. We made no distinction between regressions in relation to their length. For example, it made no difference if the reader regressed the length of one letter, the length of a word, or to the beginning of a sentence. In each instance, one regression was tallied. Regressions were scored as UEBC regressions when they took place either over or directly adjacent to new UEBC characters. Our rationale for counting regressions that occurred adjacent to and upon UEBC text is as follows: Regressions typically occur where comprehension has not been attained. That is to say, when the meaning of text has not been understood, braille and print readers reread text in order to disambiguate unclear content. Comprehension, in this respect, is a process that requires the integration of surrounding words within a context. Consequently, we judged that regressions occurring adjacent to UEBC text could reflect troubles that our readers had with processing the UEBC text itself.

Results

Our initial step in analyzing the data was to examine mean scores for trends related to reading speed, miscues, and regressions. Table 1 shows each reader's reading rate averaged across the three passages in both Form G and Form H of the NDRT. It displays the overall total mean reading rate for all readers on both forms, and the difference between the times recorded for Form G and Form H. All 8 of our participants were slowed by elements in Form H which contained characters from the UEBC (M = 11.4 words per minute, SD = 6.0). We performed a paired-samples t test to compare reading speeds of participants on Form G passages brailled in EBAE format and Form H passages in UEBC format. The results indicated that the mean reading rate for passages from Form G (M = 76.77, SD = 21.42) was significantly greater than the mean reading rate for passages from Form H (M = 65.36, SD = 18.09), t (7) = 5.39, p = .001. The effect size index, eta squared, was calculated to be .81. According to Green, Salkind, and Akey (2000), traditional eta squared values of .01, .06, and .14 represent small, medium, and large effect sizes, respectively. Our results, then, reflect a large effect size.

Table 1. Reading Rate in Words per Minute.

Reader	**Form G (EBAE)**	**Form H (UEBC)**	**Difference**
1	55.5	44.0	11.5
2	62.5	61.3	1.2
3	82.4	66.1	16.3
4	93.4	80.2	13.2
5	68.5	63.1	5.5
6	100.7	80.5	20.2
7	103.9	89.9	14.0
8	47.2	37.8	9.4
Mean	**76.8**	**65.4**	**11.4**

Table 2 shows the rate of total oral miscues produced by participants reading Forms G and H. Columns 2 and 3 reflect the total number of miscues per 100 words. Column 4 of Table 2 displays the percent of all Form H miscues that were associated with UEBC changes. Of the miscues that were tallied for readers of passages from Form H, only a small percentage, 3.5%, were associated with UEBC changes. This miscue rate on new characters is roughly in proportion to the percentage of UEBC characters in the passages (4%). Again, we conducted a paired-samples t test to compare the number of miscues read in Form G (EBAE) and the number of miscues read in Form H (UEBC). The results indicated that the mean oral miscue rate for Form G (M = 2.18, SD = 1.86) was statistically greater than the oral miscue rate for Form H (M = 1.44, SD = 1.44), t (7) = 2.99, p = .02. Eta squared was calculated to be .56, again indicating a large effect size.

Table 2. Miscue Rate

Reader	**Form G (EBAE)**	**Form H (UEBC)**	
	Miscue rate	Total miscue rate	% miscues UEBC
1	1.95	1.65	0
2	1.24	1.17	0
3	3.03	1.31	11.1
4	.98	.81	0
5	1.71	.77	0
6	1.25	.15	0
7	.81	.81	0
8	6.44	4.82	16.7
Mean	**2.18**	**1.44**	**3.5**

Note: The final column represents the percentage of Form H miscues associated with UEBC cells.

Table 3 shows the rate of total regressions made by participants as they read passages from Form G and Form H. Columns 2 and 3 reflect the total regressions per 100 words. Overall, our participants regressed more often while reading passages from Form H than Form G (24.0% and 20.4%, respectively). Column 4 of table 3 displays the total number of Form H regressions that were associated with UEBC changes. Of all the regressions tallied, nearly 20% were associated with UEBC characters (almost 5 times greater than the percentage of UEBC representation in the texts). We conducted a paired samples *t* test to compare the number of regressions in Form G (EBAE) and Form H (UEBC). The results indicated that the mean regression rate for Form H (UEBC) passages (M = 24, SD = 11.6) was statistically greater than the mean regression rate for Form G (EBAE) passages (M = 20.4, SD = 9.8) t (7) = -2.89, p = .023. Our effect size index, eta squared, was calculated to be .56, indicating a large effect size.

Table 3. Regression Rates

Reader	**Form G (EBAE)**	**Form H (UEBC)**	
	Regression rate	Regression rate total	% regressions UEBC
1	34.8	43.6	16.2
2	27.2	27.4	18.9
3	25.6	33.1	16.4
4	9.3	15.2	28.9
5	17.5	17.5	22.3
6	10.2	9.9	20.6
7	10.8	14.0	17.6
8	28.0	31.3	18.0
Mean	**20.4**	**24.0**	**19.9**

Note: The final column represents the percentage of regressions associated with UEBC cells.

Discussion

Although we did find significant differences in reading speed by comparing the two codes (i.e., participants read EBAE statistically faster than UEBC), it is arguable whether or not this difference was caused by the increased bulk of the UEBC text. On average, EBAE and UEBC words in our passages were roughly equivalent in length (4.0 and 4.2 cells per word); therefore it is likely that the differences we saw were due to the relative unfamiliarity of UEBC to our participants, and not characteristics of the text itself. The most salient impact that UEBC changes could have on current readers is that it may slow them down, and our data suggest that it will —at least initially.

On average, our eight readers were slowed slightly more than 11 words per minute while reading UEBC passages (M = 11.4, SD = 5.9); however it is not clear if this loss is attributable to insurmountable characteristics of the new code, such as longer and less-contracted words. The standard deviation that we observed reflects great variability between our readers. Therefore, it is possible that variables related to characteristics of the reader (e.g., differences in age, braille experience, and education), account partly for the tendency to slow down while reading UEBC. It is also possible (and likely, given the short training period) that our readers' overall slowing was caused by their relative inexperience at reading UEBC. If this is the case, it is conceivable to think that reading rate differences would diminish, if participants could acquire more practice reading UEBC.

Finally, in relation to reading speed, it should be noted that our passages, though equated by their publisher for content difficulty, were normalized for sighted print readers, and were not controlled for orthographic difficulty when administered in a braille format. For example, a passage in Form H mentions a literary award named for the poet Eunice Tietjens. Because of the infrequent string of letters in the poet's last name, this word may be more difficult, and thus take longer to recognize for a braille reader than for a print reader. These differences are independent of the braille type, and were not controlled between Forms G and H. As a result, we cannot be sure that the loss that we observed in reading speed was not due to inherent differences that arise when print texts are translated into braille. These concerns can only be addressed with further research utilizing materials developed for use in braille studies, and closely controlled for word-level characteristics such as frequency, length, and familiarity.

Without a doubt, reading rates among our participants were affected by our other variables of interest (i.e., miscues and regressions). We expected that miscues would be more abundant in UEBC passages, and that new braille passages would require a greater number of regressions for comprehension. Contrary to our expectations, participants made significantly fewer oral miscues while reading passages that contained UEBC than while reading passages in EBAE. This result may be related to the slower reading rates reported in Table 1 above. It is possible that factors present in the UEBC condition, for instance, the readers' unfamiliarity with the new code, may have caused them to monitor their reading more closely. Such extra vigilance would have the effect of increasing the amount of time required to complete the passage, while decreasing their number of oral miscues. If this, indeed, is what happened, then it is not inconceivable to think this difference would diminish after readers became accustomed to UEBC changes. It is also possible that the differences we measured were artifacts of the testing tool itself. Because the NDRT was normalized for print readers, we cannot rule out the possibility that passages in Form G were simply more difficult than passages in Form H for braille readers.

Overall, the number of miscues in both conditions were minimal, but miscues that were directly associated with UEBC cells were fewer in proportion to the amount of new code present in the texts (3.5% and 4% respectively).Regardless, UEBC texts may be no more likely than standard contracted texts to create comprehension difficulties because of miscues. This result speaks well of UEBC design goals aimed at introducing changes that are easily integrated by experienced readers.

Reading rates were almost certainly influenced by the statistically greater number of regressions observed in the UEBC condition. Nearly 20% of all regressions observed in the UEBC passages were associated with new code—a proportion representing about five times the amount of new code cells in the text. This suggests that readers approached new characters tentatively, rechecking to confirm their understanding when new characters were present. This is not surprising, given our readers' relative unfamiliarity with UEBC. However, because the greater number of regressions did not lead to increased miscues, we can deduce that the new code did not create difficulties in accurately reading the text. It is likely that the number of regressions would decrease if readers were to acquire confidence in their UEBC skills.

Conclusion

The purpose of our study was to examine the degree to which experienced braille readers were able to transfer their skills at reading literary standard contracted braille to the new UEBC that is currently being developed. The question is an important one because its outcome will determine the ease with which current braille readers are able to use new materials if UEBC should become the adopted standard. It has been a goal of the developers of UEBC to change only aspects of the literary standard contracted braille which would be ambiguous if the Nemeth and CBC codes were integrated with it. This has resulted in the discontinuance of 8 common contractions, now spelled out in grade 1 (e.g., the “com” contraction), or changed, making the new code different, but not, in most cases, unrecognizable to readers. In other words, many of the proposed changes to the standard literary braille would require that readers consciously unlearn contractions. This is in contrast to changes which would require readers to learn new symbols to replace old ones. It is important, given the relative scarcity of braille embossed materials, that those currently in use remain usable even if UEBC becomes the accepted standard for training new braille readers. Our results have shown that with minimal training, skilled braille readers are able to integrate new UEBC cell patterns with relative ease.

Although we expect that our data generally reflect the trends as they relate to reading rates, miscues, and regressions during UEBC decoding, several caveats to our study are worthy of reiteration. First, due to our small sample size, the statistical data presented here are extremely tentative. Although our effect sizes were large, statisticians are typically advised against making statistics-backed generalizations to populations based on so small a sample size. Furthermore, because our sample was a non-random convenience sample, the external validity of our study should be regarded with caution. Nevertheless, our data did reflect a fairly wide range of reading skills among our participants, and so, we do not believe that our sample differed from the population of older, more experienced braille readers as a whole.

A second limitation to our study involves the treatment that we administered. We did not systematically control the degree to which participants familiarized themselves with the new code. Although we telephoned each participant weekly to confirm that they were reading from the sampler, we did not record the number of hours that each participant spent in that task. As a result, we cannot be sure that each participant received the same amount of training prior to the post test sequence. This variability may have contributed to the differences in reading behavior that were observed *between* participants. For the reasons cited above, we suggest that our study be viewed as a pilot study on which further research can be built.

The goal of this pilot study was to acquire empirical data to describe the behavior of 8 experienced braille readers when presented with literary UEBC after minimal training. It is clear that adopting a new code will require that experienced braille readers learn to decode specific elements that may have become automatic due to expertise reading standard contracted braille. Initially, this will not happen without costs. Reading rates may decrease until expertise and confidence with UEBC skills is acquired. Fortunately, our data suggest that this relearning is not impossible, though possibly, it may be undesirable. Despite relatively few changes to the literary code, the slowing effects that de-contracted braille and new punctuation symbols could produce are of great concern to current users. Comments from our participants (recorded in Appendix B) reflect this concern. Of our participants, 5 out of 8 responded that they would rather not switch to UEBC given the choice. This reluctance by more experienced braille readers to shift from EBAE to UEBC will need to be addressed by BANA through education and exposure to the new code.

In our study, we did not test inexperienced EBAE readers; however it is possible that this group would experience learning the new format in a much different way than those who have read standard braille for many years. For the relatively new braille reader, the process of integrating new code forms into his/her minimal knowledge base may be much less difficult than for those having to update vast skills which took many years to acquire. For those learning UEBC as their initial braille form, the processes of learning to use the characters may be no more difficult than training as it currently exists for students of EBAE. These questions are interesting and would merit research studies of their own.

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Appendix A: Demographic Questionnaire

Unified English Braille Code Study

What is the cause of your vision loss?

Onset of vision loss (year):

How many years have you read Braille?

Do you use Braille in your job or school work?

How do you rate your Braille skills?

Have you ever been able to read print materials?

If yes, then how many years did you read print?

Highest level of education completed:

Briefly describe what you found to be the most useful changes in the new Unified English Braille Code (UEBC).

Briefly describe what you found to be most difficult in adjusting to read and use UEBC.

Given a choice, would you switch to the UEBC?

What recommendations do you have for improving UEBC?

Below, please make additional comments.

Appendix B: Participants Comments

Briefly describe what you found to be the most useful changes in the new Unified English Braille Code (UEBC).

- The Braille is more like print, because of the additional symbols.
- In the past, we didn't have bullets, etc.
- Nothing.
- The effort which is being made to combine three different Braille codes into one.
- Did not have much difficulty with the contractions and was able to read about the same speed.
- I found nothing which I liked over the Standard English Braille.
- I did appreciate the effort being made to combine all three codes into one.
- Attempting to develop corresponding symbols and construction with the standard print.
- For people who have to produce print copies of anything this is useful because it is more similar to print.
- Very little.
- If one had read print, previously, some things might make sense, for example, the decimal point.

Briefly describe what you found to be most difficult in adjusting to read and use UEBC.

- I didn't like the word "to" spelled out. We had a Braille sign for this.
- I also didn't like the word "by" spelled out; again, we had a sign for this as well.
- Reading the new symbols.
- There is just enough difference to slow me down because I have to reread to see if I am correct.
- Some of the symbols such as bold and italics are much more difficult for me to read.
- I understand that one of the reasons for the new code is to make it look more like print. Print does not have contractions like Braille so why have a few more words and fewer contractions because it will never be like print.
- The changes in the contractions. Some of them made no sense to a long-time Braille user.
- I am concerned that more space, more paper and more actual reading is going to be necessary to accomplish the same amount of material being read.
- I also had difficulty with the "-ation" sign being deleted.
- I had difficulty with the changes in the contractions and the fact that it will take more space and paper.

- It takes more space.
- The learning curve for me to relearn Braille would not be worth the effort. I can see a person learning Braille for the first time having no more difficulty learning UEBC than for the existing type of Braille.
- I do not like the contractions being removed because I have to read more characters.
- I find the underline, and italic signs difficult to read as well as the change with the number sign.
- The changes in the contractions.
- Block cap passages that are lengthy lose the sense of capitalization before they reach the end.
- I find dot 45 symbols introducing things like the degree sign confusing because dots 45 precede some word contractions.
- It would appear that we are dropping the hyphen between the whole number and its fraction.
- I think it is a waste of time to change the apostrophe.
- Why do we need the number sign twice in the time of day?
- From the examples given in the sample book I question the need for the grade one word sign.
- Only the math was really difficult.

What recommendations do you have for improving UEBC?

- Put the Braille signs back in.
- They need to have blind persons who are good Braille readers give more direct input.
- The new codes take up too much paper, make little sense and take extra time to read.
- Leave the contractions as they were in Standard English Braille. Particularly things like “to”, “com”, “and” “for” “the” etc.
- Continue to use the old contractions.
- I would put back all of the contractions including the “to” sign and the “com” sign.
- I would get more input from long time Braille users who are using Braille in their daily lives.
- Leave the grade one word sign only as a letter sign where needed such as in serial numbers including numbers and letters or addresses.
- Leave double caps at the beginning of each word.
- Look for a different symbol indicator for some print symbols like degrees.
- None.

Below, please make additional comments.

- I pretty much liked the new Braille symbols and the new symbols made sense in the way they were placed.
- In many cases, UEBC utilizes more cells than present Braille codes. An effort should be made to reduce the number of cells necessary for signs—not increase them.
- Braille should, if possible, be made less bulky--not more.

Appendix C: Informed Consent

Statement of Informed Consent

I,______________________, agree to participate in this research project entitled "BANA Pilot Project" that is being conducted by Mr. Franklin Johnson from the Rehabilitation Research and Training Center on Blindness and Low Vision (RRTC) at Mississippi State University.

I understand that the purpose of this study is to find out about the effect of changes to the Braille code proposed as the "Universal English Braille Code" on persons who are blind.

I understand that the study involves reviewing the new code and taking a test to see if it effects my reading speed and comprehension.

I understand that my participation in this study is entirely voluntary, and that if I wish to withdraw from the study or to leave, I may do so at any time, and that I do not need to give any reasons or explanations for doing so. If I do withdraw from the study, I understand that this will have no effect on my relationship with the RRTC or any other organization or agency.

I understand that I may not receive any direct benefit from participating in this study, but that my participation may help others in the future.

The members of the research team have offered to answer any questions I may have about the study and what I am expected to do.

I have read and understand this information and I agree to take part in the study.

Today's Date:__________________________
Your Signature:_______________________________

If you have any concerns or questions about this study, please contact Mr. Franklin Johnson at (662) 325-2001.

Appendix D: Reading Passages

Form G (Pre-test)

Passage 1

N. Scott Momaday was born in Lawton, Oklahoma. His father was a Kiowa Indian, and his mother was the great-granddaughter of a Cherokee. Both parents taught at Indian reservations. He spent his boyhood on a number of reservations in the Southwest, acquiring a close knowledge of American Indian culture and history. He graduated from the University of New Mexico in 1958 and went on to obtain a Ph.D. in English in 1963 from Stanford University. He became a professor of English at Stanford.

Momaday's first book, *House Made of Dawn* (1968), dealing with a young Indian's attempt to reconcile the values of an old way of life with those of the modern world, was awarded the Pulitzer Prize for fiction. Momaday had earlier written a historical study of the Kiowa tribe, and later he enlarged this work to include his impressions of the contemporary history and culture of his people. This expanded book, published under the title *The Way to Rainy Mountain,* is one of the most eloquent and perceptive accounts of American Indian life and culture yet to appear. Momaday, who has said that he considers himself primarily a poet, is the author of two books of poems. These volumes reflect his interest in American Indian subjects, but they also contain poems in a philosophical and meditative vein. In 1976 he published *The Names,* a memoir about his parents' lives and his boyhood on various reservations.

Passage 2

George Washington Carver wanted to help the southern farmer. After receiving his master's degree in agriculture in 1896, Carver became head of the newly formed Agriculture Department at the Tuskegee Institute in Tuskegee, Alabama.

Carver set up a laboratory and experimental plots for agricultural research. He employed students to help carry out experiments on different crops and on products that could be made from those crops. Carver was especially interested in the peanut and the sweet potato, crops that harbor bacteria on their roots that add nutrients to the soil. Carver discovered about 300 products that could be made from peanuts and over 100 products that could be made from sweet potatoes. These products included flour, cheese, milk, cosmetics, dyes, rubber, and peanut butter.

Carver's impressive list of products established the importance of the peanut and sweet potato. Southern farmers began to grow these crops, which were especially suited to the warm weather and the sandy soil of that region.

Carver continued his agricultural research. He published articles on practical matters such as improved farm techniques and food preservation. His work was especially appreciated during the Great Depression of the 1930s, when many people were out of work and had little money to buy food. Carver was also an influential teacher, inspiring young people to find ways to make science work for the betterment of all.

<u>Passage 3</u>

People have varying degrees of self-involvement in their everyday tasks and activities. They can be deeply involved in an activity, say, a political election, without being self-involved. That is, their evaluation of themselves (their self-esteem) is unaffected by the positive or negative outcome of the activity. Tasks differ in the degree to which self-involvement is engaged; academic examinations may elicit more self-involvement than a physical activity. There are also individual differences in extent of self-involvement in a particular task. Some people may feel disappointed when they do poorly on an examination, but do not devalue themselves, while others not only feel bad but also feel less worthy as a result of their performance.

Self-involvement in a task will often call into play such defensive behaviors as repression and rationalization, to ward off the painful feelings of lowered self-esteem. In addition, preoccupation with self interferes with task-relevant, problem-solving behavior and is especially apparent in highly anxious individuals.

Form H (Post-test)

<u>Passage 1</u>

Many insects communicate through sound. Male crickets use sound to attract females and to warn other males away from their territories. They rub a scraper on one forewing against a vein on the other forewing to product chirping sounds. Each cricket species produces several calls that differ from those of other cricket species. In fact, because many species look similar, entomologist often use the calls to identify the species. Mosquitoes depend on sound, too. Males that are ready to mate home in on the buzzing sounds produced by females. The male sensed this buzzing by means of tiny hairs on his antennae, which vibrate only to the frequency emitted by a female of the same species.

Insects may also communicate by tapping, rubbing, or signaling. Fireflies use flashes of light to find a mate. Each species of firefly has its own pattern of flashes. Males emit flashes in flight, and females flash back in response. This behavior allows male fireflies to locate a mate of the proper species. However, they must beware of female fireflies of the genus *Photuris*, which can mimic the flashes of other species. If a male of a different species responds to the flash or a *Photuris* female and attempts to mate, the female devours him. This is surely one of the more unusual behavioral adaptations in the enormously successful world of insects.

Passage 2

Gwendolyn Brooks was born in Topeka, Kansas, but grew up in Chicago, Illinois, the setting for much of her writing. Her love of poetry began early. At the age of seven, she "began to put rhymes together," and when she was thirteen, one of her poems was published in a children's magazine. During her teens she contributed more than seventy-five poems to a Chicago newspaper. In 1941 she began attending classes in poetry writing at the South Side Community Art Center, and several years later her poems began appearing in Poetry and other magazines. Her first collection of poems, *A Street in Bronzeville*, was published in 1945. Four years later, *Annie Allen*, her second collection appeared. Called "essentially a novel," it is divided into three parts – "Notes from the Childhood and the Girlhood," "The Anniad," and "The Womanhood" – and tells the story of Annie's life. Brooks has also published a novel, *Maud Martha* (1953), about a young black girl growing up in Chicago.

In 1950 Brooks was awarded the Pulitzer Prize for *Annie Allen*. She has receive a number of other awards and honors, including several Poetry Workshop Awards of the Midwest Writers' Conference, two Guggenheim Fellowships, an award from the American Academy of Arts and Letters, and the Eunice Tietjens Memorial Award given by Poetry magazine.

Passage 3

One of Jung s best-known contributions is his personality typology of two basic attitudes, or orientations, toward life: *extraversion* and *introversion*. Both orientations are viewed as existing simultaneously in each person, with one usually dominant. The extravert's energy is directed toward external objects and events, while the introvert is more concerned with inner experiences. The extravert is outgoing and makes friends easily; the introvert frequently prefers solitude and cultivates few relationships. There is a substantial amount of empirical evidence indicating that extraversion-introversion is indeed a significant personality dimension. For example, in anxiety-provoking situations, there is evidence that extraverts are much more likely to choose to be with other people than to be alone.

Although Jung s distinction between extraversion and introversion has been confirmed, most investigators now view extraversion-introversion as a single personality dimension along which people vary, in contrast to Jung s conception of a pair of opposing attitudes. For Jung, these attitudes exist simultaneously and in opposition, even though one may dominate the other. When there is exaggerated activity in the service of one attitude (say, when an extravert has spent several days and evenings in social activity), then, Jung believed, psychological activities will occur that are directed toward achieving balance.