



Estimating the Difficulty Level of EFL Texts: Applying Bloom's Taxonomy of Educational Objectives

Natasha Pourdana (Corresponding author)

Department of English Translation, Faculty of Literature and Foreign Languages

Islamic Azad University, Karaj Branch, Iran

Center for Global Education, Gyeongju University, South Korea

Tel: +82-010-8974-7709 E-mail: natasha.qale@gmail.com

John S. Rajeski

E-mail: asiajstr@gmail.com

Received: 05-08-2013

Accepted: 09-09-2013

Published: 01-11-2013

doi:10.7575/aiac.ijalel.v.2n.6p.202

URL: <http://dx.doi.org/10.7575/aiac.ijalel.v.2n.6p.202>

Abstract

The purpose of the present study was to explore the impact of difficulty level of texts on EFL learners' reading comprehension through the application of Bloom's cognitive taxonomy. The researchers' primary assumption was that reading EFL texts would become more difficult as the learners' performance proceeds from a text targeting their Knowledge abilities through the texts tapping on their Comprehension, Application, Analysis, Synthesis to Evaluation abilities. To fulfil the ultimate purpose of the research, 32 undergraduate students majoring in English translation at Islamic Azad University, Karaj Branch, Iran took part in this investigation in 2011. In addition to Comprehensive English Language Test (CELT), the participants were given a teacher-made reading comprehension test, included six short reading passages from 154 to 166 ranges of words and 30 multiple-choice items which compiled and constructed based on the six levels in the hierarchy of Bloom's cognitive taxonomy. Analysis of Variance (ANOVA) proved that except for the fifth level, the Synthesis text, the EFL learners' performance was graded properly based on the difficulty levels expected and explored in Bloom's levels of Cognitive Domain. The findings in this study are considerably practical in developing EFL materials and teaching reading skills and strategies.

Keywords: Difficulty level, EFL, Bloom's Hierarchy of Educational Objectives, Cognitive Domain, Reading

1. Introduction

Today, reading skill within EFL contexts is viewed as an active process by which the language learner is actively involved in understanding the text in order to properly grasp the writer's intended meaning. Reading as a language-learning task has been defined by a number of theorists. While to Alderson (2001) "reading is a complex, interactive activity including both lexical and text-processing skills", Rumptz (2008) considers reading as "a complex process involving visual discrimination of printed letters, identification of those letters as the components of words, and the interpretation of their meaning". Al-Yousef (2005) stresses that "reading comprehension is a kind of combination of identification and interpretation skills in which readers dynamically interact with the text as they endeavour to discover the text meaning through the use of linguistic or systemic knowledge (bottom-up) and schematic knowledge (top-down)". Similarly, Reitsma et al (2011) regard reading as "a receptive dynamic process in which the reader is endeavouring to make a connection between ideas in the text". To explain the reading process, only three well-known theoretical models have been developed due to an innate vagueness. These models are known as *bottom-up*, *top-down*, and *interactive* or *psycholinguistic*.

In the bottom-up model, in order to grasp the meaning of the text, the processing starts with the raw input and moves upward through increasingly detailed analysis (Reitsma et al., 2011). Stanovich (1980) points out that the bottom-up model has inherent difficulties due to not having any mechanism in which higher-level processes can influence the lower-level processes. As Goodman (1967) mentions, reading involves a kind of interaction between language and thought whereas a reader brings the sum of their available language, experience, and thought development to a reading task. He holds that reading as a "psycholinguistic guessing game" results from skillful selection of the fewest most productive cues to make guesses right from the beginning. Therefore, as Rumptz (2008) emphasizes, the top-down model puts much pressure on the reader's active participation in the reconstruction of the text meaning via use of his knowledge-base to make predictions. The top-down processing model wanes in popularity despite eliminating the previous issues. Stanovich (1980) points to two main drawbacks to the top-down model. One is the excessive ambiguity

in its conceptualization. The other is the un-necessity to generate hypothesis unless the process of hypothesis generation about subsequent words takes less time compared to the recognition of words based on the visual information.

Over recent years, however, the *Interactive* or *Psycholinguistic* model has gained popularity among reading theorists to compensate for the shortcoming of previous models. Rumelhart and McClelland (1981) assert in the interactive model bottom-up and top-down processing models combine with each other in a cooperative fashion in order to determine the probable interpretation of the input. They record that the reading process in the interactive model begins with making expectations or hypotheses by means of one's knowledge of the structure of letters, words, phrases, sentences, and discourse features such as nonlinguistic aspects of text to anticipate what information the visual input is likely to provide. After accessing visual information, hypotheses consistent with the input will be strengthened, and those inconsistent with the input will be weakened.

To elaborate the Interactive model, Berardo (2006) asserts, "reading is an interactive process in which both processes, namely, top-down and bottom-up are essential for any reading activity to occur". He states that the function of top-down is to predict the global meaning of the text through either clues provided in the text or readers' *schema knowledge*. The function of bottom-up processing is to check the retrieved meaning through carefully monitoring the grammar and vocabulary in the text. Undoubtedly, the reading process is much more than the process of identifying words and structures. The interactive model focuses on simultaneous integration of both language knowledge and background knowledge.

Some theorists have attempted to identify the major cognitive processes needed in reading the texts. Vanden Broek (2009) asserts "readers require some cognitive processes such as drawing causal inferences, decoding the words or phrases in the text, integrating them with lexical concepts in their minds, and activating background knowledge to fully comprehend the text". Moreover, Cain et al. (2004) propose two types of cognitive processes actively operating during reading comprehension, namely, lower-and-higher level processing. Lower level processing includes word-reading accuracy, verbal and semantic skills. Higher level processing includes inference generation, integration, comprehension monitoring, and knowledge about text structure. Similarly, Redono (1997) identifies such cognitive processes activated during reading as inferring, categorizing, arguing, and predicting. In short, there is a general consensus among researchers with regard to the cognitive processes involved in reading skills. A majority of them acknowledge the roles of prediction, inference, decoding, synthesis, text knowledge, and background knowledge as a basis for effective comprehension.

In the context of language learning, to assess a language learners' performance on reading comprehension, language teachers' ambition is taking all these cognitive processes into consideration. Unfortunately, most reading comprehension assessment techniques designed by language teachers largely target the textual information. Such assessment techniques usually ignore the language learners' higher-level thinking skills involved in the process of reading. To design techniques that gauge all levels of readers' mental processes; therefore, Benjamin Bloom's cognitive taxonomy (1956) seems appropriate as a hierarchy of fundamental human cognitive skills ordered from the lowest to the highest level of complexity.

In 1956, Bloom attended the American Psychological Association in Boston to find possible solutions to the problems involved in organizing classified educational objectives. As a result, he reached a consensus with the committee to design his taxonomy to improve communication among examiners. In addition, they anticipated that the taxonomy would aid EFL teachers and test-takers through providing a basis for developing curricula, instructional techniques, and testing techniques.

Compared to a classification scheme, by *taxonomy*, Bloom meant the structural rules are arranged based on complexity criteria, and there is no arbitrary element in this taxonomy scheme. In other words, the arrangement of educational behaviors is from simple to complex while the successively complex behaviors encompass the less complex behaviors. According to Bloom et al. (1956), this taxonomy includes three major domains, namely, the *cognitive*, the *affective*, and the *psychomotor*. The affective and psychomotor domains are beyond the scope of this research, so our main concern is the Bloom's cognitive domain. Khorsand (2009) briefly explains these six levels as follows:

- Knowledge: The lowest level in cognitive domain is the ability to simply recall the previously learned materials.
- Comprehension: A step beyond the knowledge level is the ability to grasp the meaning of the material.
- Application: A higher-level of understanding than the comprehension level is the ability to apply the learned material, methods, rules, concepts, laws, and theories to new and concrete situations.
- Analysis: It refers to the ability of breaking down material into its component so as to understand its internal structure.
- Synthesis: An ability to put parts together in a creative way in order to form a new whole is almost the most difficult cognitive process.
- Evaluation: The most complex level in the cognitive hierarchy is concerned with the ability to appraise the value of received material.

Huitt and Segars (1981) record that the major intention of Bloom's taxonomy is what the teachers expect students to know, can be arranged in a hierarchy from the least to the most complex. He lists some sample verbs for Bloom's six levels of cognitive domains (1956) as follow:

Table 1. Bloom's Behavioral Objectives

Level	Behavioral Objectives
Knowledge	Write, List, Label, Name, State, Define
Comprehension	Explain, Summarize, Paraphrase, Describe, Illustrate
Application	Use, Compute, Solve, Demonstrate, Apply, Construct
Analysis	Analyze, Categorize, Compare, Contrast, Separate
Synthesis	Create, Design, Hypothesize, Invent, Develop
Evaluation	Judge, Recommend, Critique, Justify

Bloom's et al. (1956) believed that evaluating educational objectives is a constant concern in curriculum development. They claimed that their cognitive taxonomy could be utilized as a constructive set of guidelines for measuring every class of objectives from the simpler to complex. Huenecke (1970) holds that teaching behavior of the EFL teachers who use these curriculum guides might be significantly different. Therefore a major objective in this study was to examine the Iranian EFL learners' performance on reading comprehension questions prepared and arranged following Bloom's hierarchy of educational objectives. The researchers' speculation was to observe (1) the possible relationship between the EFL learners' performance on the reading comprehension questions and their levels of English proficiency, and (2) the decreasing level of the EFL learners' performance as the difficulty levels of questions moved up the hierarchy from the Knowledge level through Comprehension Level, Application Level, Analysis Level, Synthesis Level to Evaluation level.

2. Method

The participants included 32 senior undergraduate students majoring English translation at Islamic Azad University, Karaj Branch, Iran. They were selected based on the convenient method of sampling in the academic year of 2012. The participants were 22 to 37 years of age, of both genders and of similar nationality.

To homogenize the participants for their level of English proficiency, a Comprehensive English Language Test (CELT) was administered. A week later, a 45-minute, teacher-made reading comprehension test, designed and validated by the researchers, was conducted with the participants. The test consisted of six short reading passages with a range of 154 to 166 range of words followed by 30 multiple-choice items. The texts difficulty level was successively increased based on the six cognitive processes ranked in Bloom's hierarchy of cognitive domain. For instance, to successfully perform on Application text, the participants had to *apply* their knowledge of English vocabulary to complete a sentence about hypothyroidism. Similarly, success in work with Evaluation text required the participants to *judge* the attitude of the author on the need for telescopes at various locations on Earth. In order to determine the reliability of the placement test results, Cronbach's Alpha test was conducted for the total number of test items. The obtained Cronbach $\alpha=.706$, significant at $p\text{-value} < 0.05$, demonstrated the relative consistency of the participants' performance on total test items.

The researcher collected two sets of scores from CELT and reading comprehension test which both were undertaken Analysis of Variance (ANOVA) test. In both tests, every true response to items was awarded as 1 point and every wrong response as zero.

3. Results and Conclusion

The scores obtained in Comprehensive English Language Test (CELT) and the reading comprehension test (RCT) is summarized in Table 2.

Table 2. Descriptive Statistics for CELT and RCT

Test	K	Minimu m	Maximu m	Mean	Std.		Skewness	
					Deviation	Statistic	Std. Error	Statistic
CELT	72	24.00	56.00	41.18	1.64	9.28	-.662	.117
RCT	30	11.00	23.00	18.59	0.61	3.45	-.795	.141

As Table 2 represents, scores in CELT and RCT have similar ranges and averages, however, the standard deviation in CELT reports a wider scope of scores than in RCT. This diversity sounds justifiable as the participants were predisposed to several English comprehension courses prior to this research. Both sets of scores are negatively skewed. To test the normality of scores distribution, the Kolmogorov-Smirnov test was conducted. The insignificant amount of Z for both tests, proved the normal distribution of scores in CELT and RCT ($z=0.873$, $p<0.05$).

To estimate the difficulty level of the texts, the researchers' assumption was in favour of an increasing difficulty from Knowledge through Evaluation texts, which could be demonstrated through the participants' performance on the reading comprehension questions. Therefore, the researchers conducted Analysis of Variances test with six short texts that were carefully prepared based on the six levels of Bloom's Cognitive Domain (i.e., Knowledge, Comprehension, Application, Analysis, Synthesis and Evaluation) in the taxonomy of educational objectives.

Table 3. Test of ANOVA

Texts		Sum of Squares	df	Mean Square	F	Sig.
KNOWLEDGE	Between Groups	12.719	21	.606	1.730*	.020
	Within Groups	3.500	10	.350		
	Total	16.219	31			
COMPREHENSION	Between Groups	22.135	21	1.054	1.723*	.030
	Within Groups	14.583	10	1.458		
	Total	36.719	31			
APPLICATION	Between Groups	44.792	21	2.133	3.506*	.020
	Within Groups	6.083	10	.608		
	Total	50.875	31			
ANALYSIS	Between Groups	33.958	21	1.617	1.481*	.040
	Within Groups	10.917	10	1.092		
	Total	44.875	31			
SYNTHESIS	Between Groups	31.667	21	1.508	1.552	.400
	Within Groups	14.333	10	1.433		
	Total	46.000	31			
EVALUATION	Between Groups	24.552	21	1.169	.784*	.000
	Within Groups	14.917	10	1.492		
	Total	39.469	31			

As Table 3 indicates, a test of ANOVA was run among the mean scores of the participants on 6 prepared texts. For Knowledge text, $F(21, 10)=1.730$ ratio was obtained which was significant at $p\text{-value}<.020$. For Comprehension text, the $F(21, 10)=1.723$ was obtained which was significant at $P<.030$. The F ratio was significant for Application text, too. ($F(21, 10)=3.506, P<.020$) Regarding Analysis text, the $F(21, 10)=1.481$ was significant at the $P<.040$. However, for Synthesis text, the $F(21, 10)=1.05$ turned out to be insignificant at $P<.400$. Finally, for Evaluation text, the $F(21, 10)=.784$ was significant at $P<.000$

To discuss the statistical results in this study, again, the focus of the current investigation was carried out to estimate the difficulty levels of EFL texts. The researchers' initial assumption was that the EFL learners' performance on a series of reading comprehension texts which were ranked following Bloom's levels of cognitive domain would show a descending pattern which would match the ascending difficulty of the texts.

After collecting data and running ANOVA, the following findings were obtained.

1. The first research question was whether an English text demanding only learners' knowledge of language stands at Level 1 of difficulty, according to Bloom's cognitive domain. Based on the findings in this study, the index of $F=1.730$ at $p\text{-value}<.05$ level of significance, confirmed that it is the easiest type of text for EFL learners.
2. The second research question was whether the text demanding only learners' comprehension ability stands at Level 2 of Bloom's cognitive domain. The findings supported this assumption as the F value decreased from 1.730 to 1.723 significantly at $p\text{-value}<.05$.
3. The third research question was whether reading an English text demanding only learners' application ability stands at Level 3 of Bloom's cognitive taxonomy. Despite the value of F for Application text increased from .723 to 3.506, it was significant at $p\text{-value}<.05$.
4. The fourth research question was whether a text only demanding EFL learners' analytic ability stands at Level 4 of Bloom's cognitive domain. Statistically, the significant index of $F=1.481$ at $p\text{-value}<.05$ showed a decrease and supported its standing positing.
5. The fifth research question was whether a text only demanding EFL learners' synthetic ability stands at Level 5 of Bloom's cognitive domain. Unlikely to other findings, the descending value of index $F=1.052$ was insignificant at $p\text{-value}>.05$.

value<.05. This finding rejected the stand of Synthesis texts as more demanding than Analysis texts and less difficult than Evaluation texts. In other words, statistically, the within group differences outweighed the between group differences which was incongruent to the researchers' initial assumption.

6. The sixth research question was whether reading an English text only demanding learners' evaluating ability stands at Level 6 of Blooms' cognitive domain. The descending index of $F=.784$, significant at $p\text{-value}<.05$, confirmed the stand of Evaluation texts as the most difficult for the EFL learners..

Interpreting the findings in the current study, the researchers concluded that Bloom's taxonomy of educational objectives in cognitive domain was a breakthrough in grading EFL texts for difficulty. Except for texts of Synthesis that were not statistically supported for an exact position on the ladder of difficulty, the other 5 stands gave a clear-cut image for developing EFL materials and reading texts. The researchers' explanation for the unexpected results mainly goes for the misinterpreting, narrowing down, or delimiting the number of behavioral objectives listed in Bloom's while preparing the reading comprehension items.

The findings of current research, however, provide the EFL teachers and test writers with a model of reading comprehension assessment through application of Bloom's 6 levels of cognitive domain which properly measure the EFL readers' performance on graded reading comprehension text based on levels of difficulty. In turn, EFL textbook designers can develop their material based according to Bloom's cognitive domain, which seems compatible with currently used models of material development. The researchers strongly recommend further research on constructing more tests that exactly operationalise Bloom's behavioral objectives underlying every level of cognitive domain. They believe that the more behavioral objectives encompass the test items followed by the reading texts, the more properly the text is graded for its level of difficulty. The length of the texts and the number of comprehension tests are the questions, which require further experimentation. The researchers in this study focused on preparing texts with general topics, which evidently made the job easier for selecting participants and collecting data. Further research on developing English for specific courses or contents is strongly recommended.

Acknowledgements

The authors would like to sincerely thank Elham Jafari, the MA graduate from Alborz Institute for Higher Education, Qazvin, Iran for her contribution into data collection in this experimental study.

References

- Alderson, J. C. (2001). *Assessing reading*. Cambridge: Cambridge University Press.
- Al-Yousef, H. S. (2005). Teaching reading comprehension to ESL/EFL learners. *The Reading Matrix*, 5(2): 387-394.
- Berardo, S. A. (2006). The use of authentic materials in the teaching of reading. *The Reading Matrix*, 6(2): 1-10.
- Bloom, B. S., Englehart, M. D., Furst, E. J., Hill, V. H., and Krathwohl, D. R. (1956). *Taxonomy of educational objectives*. Longmans Green: New York.
- Cain, K., Bryant, P. and Oakhill, J. (2004). Children's reading comprehension ability: Concurrent prediction by working memory, verbal ability, and component skills. *The Journal of Educational Psychology*, 96: 31-42.
- Goodman, K. S. (1987). Reading: A psycholinguistic guessing game. *Journal of the reading specialist*, 6: 126-135.
- Khorsand, K. (2009). *Cognitive levels of questions used by Iranian EFL teachers in advanced reading comprehension tests*. Vikas Publishing House: PVT.
- Redondo, M. (1997). Reading models in foreign language teaching. *Revista Alicantina de Estudios Ingleses*, 10:139-161.
- Rumelhart, D. E and McClelland, J. L. (1981) *Interactive processing through spreading activation*. Hills Dale NJ: Erlbaum.
- Rumptz, D. Theoretical model of reading ability. Retrieved 14 Oct., 2008 http://www.geocities.com/rumptz_sh8kr/Modelofreading.htm.
- Stanovich, K. E. (1980). Toward an interactive-compensatory model of individual differences in the development of reading fluency. *Reading Research Quarterly*, 16(1): 32-71.
- Vanden Broek, P. (2009). Improving reading comprehension: Connecting cognitive science and education. *Cognitive Critique*, 2: 1-25.

Appendix

Reading Comprehension Test

Knowledge

The umbrella is an old idea. It has not changed much over time. Old sculpture from Middle East shows the king with an umbrella. The sculpture is over 1000 years old. At that time, common people did not have umbrellas. Only royalty had them. More than 2000 years ago, fashionable women carried umbrellas in an ancient Greece.

In China, only royalty used umbrellas. There is not much information about umbrellas in Europe in the Middle Ages. People probably used their coat to protect themselves from the rain. People in the south pacific used umbrellas made of palm leaves to protect themselves from the sun and rain.

There have been many improvements to umbrellas. Now, modern umbrellas are better than the old umbrellas. The old umbrellas were often made of oiled silk. Modern umbrellas are made of cotton or plastic. Old umbrellas had ribbing made of wood. Modern ones have steel ribs. The trunk of modern umbrella extends like a telescope.

1. Fashionable women had umbrellas in -----
 - a. Europe in the middle age
 - b. The south pacific
 - c. Ancient Greece
 - d. The Middle East
2. In ancient china-----
 - a. Only royalty had umbrellas
 - b. Umbrellas were made of palm leaves
 - c. Umbrellas looked modern
 - d. Umbrellas had steel ribs
3. People in the south pacific used-----
 - a. Umbrellas made of palm leaves
 - b. Umbrellas made of plastic
 - c. Collapsing umbrellas
 - d. Umbrellas made of cotton
4. Old umbrellas were often made of-----
 - a. Steel
 - b. Cotton
 - c. Plastic
 - d. Oiled silk
5. The best synonym for modern is-----
 - a. Young
 - b. Old
 - c. New
 - d. Nice

Comprehension

Biofeedback is a safe, drug-free alternative for the treatment of migraines, tension type headaches, chronic pain, sleep disorders and more. It is a treatment technique in which people are trained to improve their health by using signals from their bodies. Receiving feedback from a computer, patients are trained to adjust physical features like skin temperature, muscle tension, heart rate or blood flow-changes that can lead to decreased pain and stress.

Biofeedback reduces the stress response and brings stability and calmness to the nervous system. Clinical biofeedback techniques are used to treat such conditions as tension headaches, high blood pressure and its opposite, low blood pressure, epilepsy, cardiac arrhythmias, paralysis and other movement disorders.

It is very effective for migraines. Studies have shown that biofeedback can be just as effective as more of preventive medications we use. About 85 percent to 90 percent of patients with chronic headaches respond positively to biofeedback. Biofeedback also serves as an excellent bridge in assisting patients wear off medications.

6. Unlike preventive medications, biofeedback requires the patient to ----- in the treatment process.
 - a. Avoid any training
 - b. Remain unconscious
 - c. Adopt a submissive role
 - d. Involve actively
7. Biofeedback-----some preventive medications.
 - a. Should take the place of
 - b. Should be used in the absence of
 - c. Can be an alternative to
 - d. Can hardly be as effective as
8. Patients with lasting headaches-----biofeedback.
 - a. Are more likely to benefit from
 - b. Are at a disadvantage regarding
 - c. Should prefer preventive medications to
 - d. Would seldom receive training before they use
9. Biofeedback can help patients-----medications.
 - a. Exploit the advantages of
 - b. Continue relying on
 - c. Get familiar with complications of
 - d. Keep away from
10. The nervous system has shown to be-----biofeedback.
 - a. Alien to
 - b. Compatible with
 - c. Identical to
 - d. Non-responsive to

Application

The thyroid, a small gland located in the front of the neck, produces thyroxine hormones that regulate the rate at which every cell in your body functions. When thyroxine is needed by the body, the thyroid gland excretes it directly in to bloodstream. Accordingly; thyroid disease can significantly impact a person's over all health. Depending on the type of thyroid disease, symptoms can vary radically.

Hyper thyroidism, condition in which the thyroid produces too much hormone, results in nervousness, increased sweating, increased heart rate, and other problem. Conversely, in hypothyroidism, little hormone will be produced by thyroid gland, results in tiredness, coldness, slow heart rate, constipation, unexplained weight gain, etc.

Hashimoto's disease is condition in which the immune system attacks the thyroid gland. In this case, the antibodies don't stimulate thyroid hormone production rather diminish it. This disease is most likely an inherited condition. Its thyroid disease symptoms may include enlarged thyroid gland, intolerance to cold, difficulty swallowing, fatigue, constipation, and early graying of hair.

11. Which of following is a probable result of hyperthyroidism?
 - a. Fatigue
 - b. Constipation
 - c. Quick heart rate
 - d. Slow heart rate
12. A patient whose thyroid gland produces too little thyroxine may suffer from-----
 - a. Thyroid cancer
 - b. Hashimoto's disease
 - c. Hypothyroidism
 - d. Hyperthyroidism
13. A mother suffering from-----may carry it to her children.
 - a. Grave's disease

- b. Hashimoto's disease
 - c. Hyperthyroidism
 - d. Hypothyroidism
14. The symptoms of not being able to swallow and digest the food properly may be the result of -----.
- a. Hypothyroidism
 - b. Thyroid nodules
 - c. Hashimoto's disease
 - d. Hyperthyroidism
15. Which person may be prone to hypothyroidism?
- a. A person whose weight increases unexplainably.
 - b. A person whose heart beats quickly.
 - c. A person who can't tolerate hotness.
 - d. A person who becomes nervous irrationally.

Analysis

Members of the flatfish family, sand dabs and flounders, have an evolutionary advantage over many colorfully decorated ocean neighbors in that they are able to adapt their body coloration to different environments. These aquatic chameleons have flattened bodies that are well suited to life along the oceans floor in the shallower areas of the continental shelf that they inhabit.

They also have remarkably sensitive color vision that registers the subtlest gradations on the sea bottom and in the sea life around them. The information about the coloration of the environment is carried through the nervous system to chromatophores, which are pigment carrying skin cells.

These chromatophores are able to accurately reproduce not only the colors but also the texture of the ocean floor. Each time that a sand dab or flounder finds itself in a new environment; the pattern on the body of the fish adapts to fit in with the color and texture around it.

16. It is **NOT** stated in the passage that sand dabs-----.
- a. are a type of flatfish
 - b. have flattened bodies
 - c. have evolved
 - d. are colorfully decorated
17. According to the passage, it is **NOT** true that sand dabs and flounders-----.
- a. have flattened bodies
 - b. live along the ocean floor
 - c. live in the deepest part of the ocean
 - d. live along the continental shelf
18. All of the following are stated about the vision of sand dabs and flounders **EXCEPT** that they are-----.
- a. overly sensitive to light
 - b. able to see colors
 - c. able to see the sea bottom
 - d. aware of their surroundings
19. It is **NOT** true that chromatophores-----.
- a. are skin cells
 - b. carry pigment
 - c. reproduce colors
 - d. change the ocean floor
20. It is **NOT** mentioned in the passage that sand dabs and flounders-----.
- a. move to new environments
 - b. adapt their behavior
 - c. change color
 - d. adapt to textures around them

Synthesis

When her grandmother's health began to deteriorate in the fall of 1994, Mary would make the drive from Washington, DC to Winchester, VA., every few days. She hated highway driving, finding it ugly and monotonous. She preferred to take meandering back roads to her grandmother's hospital.

Toward the end of her journey, it was here that she discovered a surprising bit of beauty during one of her trips. Along the median of the high way, there were a long stretch of wild flowers. They were thin and delicate and purple, almost poetic in appearance.

Mary was seized by an uncontrollable urge to pull over on the high way and yank a bunch from the soil. She carried them in to her grandmother's room when she arrived at the hospital and placed them in a water pitcher by her bed. She thanked Mary for the flowers, commented on their beauty. Mary was overjoyed by the flowers' seeming ability to wake something up inside her ailing grandmother.

21. Which best describes what stopping for flowers on the side of high way became for Mary?

- a. tedious
- b. ritual
- c. regretful
- d. torturous

22. What do the flowers seem to come to signify for Mary?

- a. an opportunity to take a rest on the side of the road
- b. an opportunity to pull off on the side of the road
- c. a chance to converse with her grandmother
- d. a chance to make the hospital room smell better

23. Using the passage as a guide, what kind of person does Mary seem to be?

- a. she is patient.
- b. she is the safest driver.
- c. she is drawn to the beauty in nature.
- d. she feels no sympathy for her grandmother.

24. The author might have described the flowers as poetic to-----.

- a. depict this passage as a poem
- b. convey that this type of flower had been written about by poets
- c. contrast the flowers with other flowers considered less beautiful
- d. convey that Mary felt the flowers were as beautiful as verses on a page

25. What title would best fit this passage?

- a. the fall
- b. on the road
- c. wild flower poetry
- d. living for tomorrow

Evaluation

The Hubble telescope was launched into space with great fanfare on April 25, 1990. Although there are many powerful telescopes at various locations on Earth, the Hubble telescope was expected to be able to provide considerably better information. By launching the Hubble telescope in to space, NASA, was, in essence, placing an observatory above the Earth's atmosphere.

Unfortunately, the Hubble telescope was initially delayed in relaying its first pictures back from space due to a simple mathematical miscalculation. The Hubble telescope relies upon certain stars to orient its observations, and astronomers working on the pointing instructions for the telescope used charts created in 1950, with adjustments for the movements of the stars in the ensuing period.

In making these adjustments, however, astronomers added the amount of the adjustment rather than subtracting it, a simple check book-balancing error. The adjustment was a change of only half a degree, but by adding half a degree rather than subtracting it, the telescope's aim was misdirected by millions of miles.

26. Why does the author mention **many powerful telescopes at various locations on Earth** in paragraph 1?

- a. to emphasize the need for telescopes at various location on Earth
- b. to show that the Hubble telescope was different from existing telescopes

- c. to indicate how the atmosphere improves the quality of information from space
- d. to emphasize the similarities between the Hubble telescope and other telescopes
27. The author uses the phrase **in essence** in paragraph 1 in order to indicate that the information that follows the phrase
- provides a simplified description of a previously stated situation
 - indicates the cause of a previously stated effect
 - provides further information about the power of other telescopes
 - indicates the classification to which previously stated examples belong
28. Why does the author begin paragraph 2 with **unfortunately**?
- it indicates that NASA has been unhappy with all of Hubble's photographs.
 - it shows that NASA's plan to use stars to orient the Hubble telescope was misguided.
 - it emphasizes the need to have telescopes on Earth.
 - it indicates that high expectations were not initially met.
29. The author mentions **a simple checkbook balancing error** in paragraph 3 in order to suggest that
- the astronomers faced with a lot of difficulties while making adjustment
 - the adjustments made by the astronomers should have been less than half a degree
 - a more balanced approach was needed when making adjustment
 - the mistake made by the astronomers was a simple, every day error
30. Why does the author mention the detail **millions of miles** in paragraph 3?
- it reinforces the idea that the mistake had a huge effect.
 - it emphasizes the wide range of the Hubble telescope.
 - it demonstrates that the Hubble telescope reached its destinations.
 - it helps the reader to understand how powerful the Hubble telescope is.