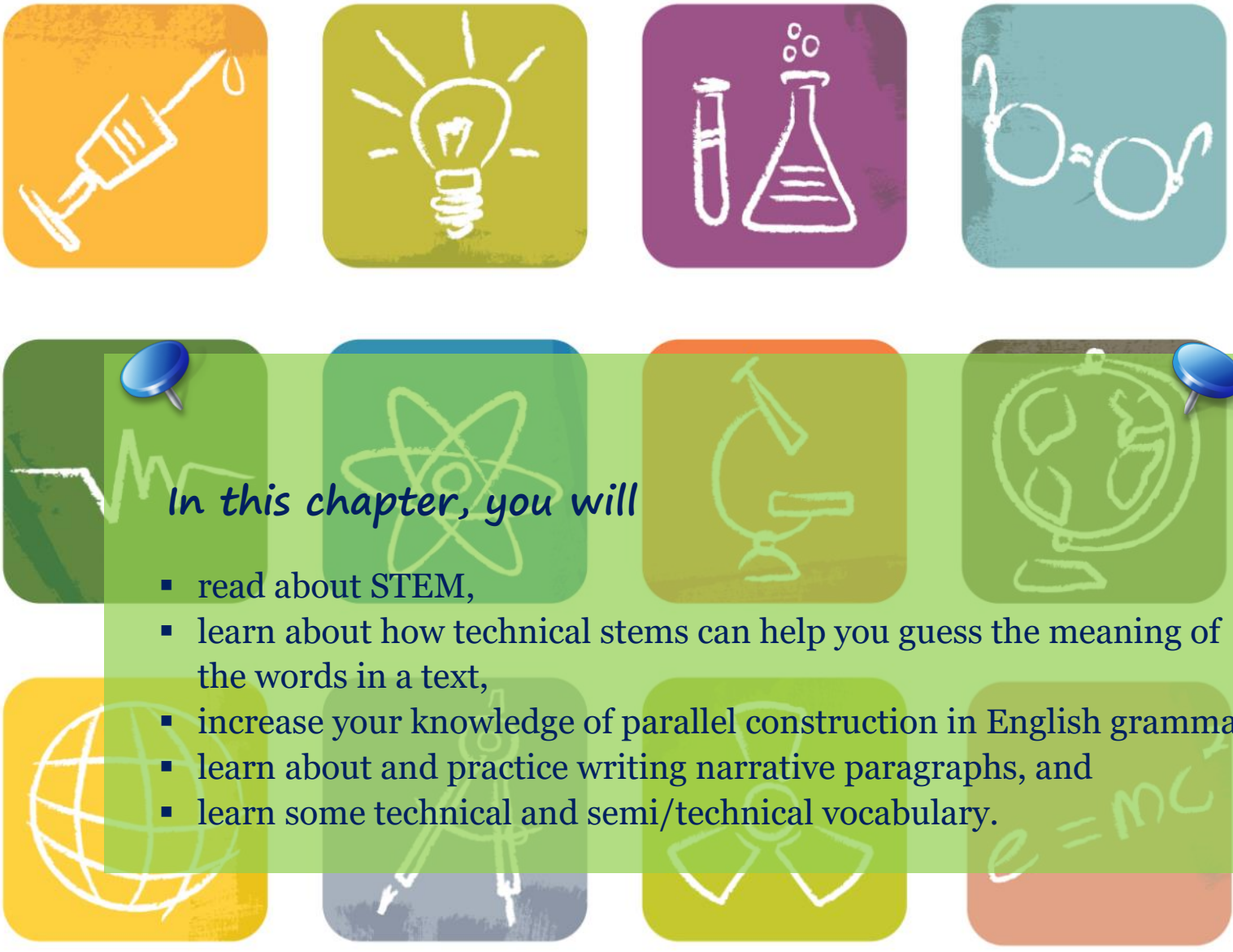
CHAPTER 6

STEM



In this chapter, you will

- read about STEM,
- learn about how technical stems can help you guess the meaning of the words in a text,
- increase your knowledge of parallel construction in English grammar,
- learn about and practice writing narrative paragraphs, and
- learn some technical and semi/technical vocabulary.

STEM

TUNE IN FOR THE READING

Reading Strategy 6a: STEMS

A stem or root is a word or word part from which other words grow, usually through the addition of prefixes and suffixes. A stem may consist of a single root, of two roots forming a compound stem, or of a root and one or more affixes. Understanding the meanings of the common word roots can help us guess the meanings of new words. The table below defines and illustrates the most common roots, many of which have appeared in the reading selections of this book.

Root	Meaning	Example	Root	Meaning	Example
-phon-	sound	telephone	-tele-	far off	telepathy
-photo-	light	photograph	-scrib-, -script-	write	describe
-port-	carry	export	-sens-, -sent-	feel	sensitive
-terr-	earth	territory	-vac-	empty	evacuate
-ast(er)	star	astronomy	-geo-	earth	geography
-audi-	hear	audible	-graph-	write	autograph
-auto-	self	automatic	-log-, -logue-	thought	logic
-bio-	life	biology	-luc-, -lum-	light	illuminate
-dict-	say	dictate	-man(u)-	hand	manual
-duc-	lead, make	produce	-mand-	order	demand
-gen-	give birth	generate	-mis-, -mit-	send	transmit
-phil-	love	philharmonic	-vid-, -vis-	see	visible

Reading Strategy 6b: MATCHING HEADINGS WITH SECTIONS

As said in chapter one, headings in a text can work as guides helping us better understand the organization of a text. So always, before you read the whole text, you need to read the headings to get some idea of the whole passage. However, sometimes the headings are already taken away from the passage and you are asked to match them with each paragraph or section in the passage.

In order to do this type of task well when matching headings with paragraphs, you must understand the gist, or main ideas, of each paragraph. However, when matching headings with sections of the text, often you don't have enough time. Therefore, a more efficient strategy might help. In this case instead of reading the all paragraphs, read the first sentence of each paragraph in each section and try to match the headings with sections. Often the first sentence of each paragraph contains the main idea of that paragraph. That's why understanding those sentences can help you understand the whole paragraph much better.

Now look at the following headings. They belong to the text you are going to read. Try to match them with sections in the text by just reading the first sentence of each paragraph in each section.

1. STEM; Rewards & Challenges
2. STEM Jobs' Needed Qualifications
3. Job Market in the Future
4. How to Prepare for the STEM Market

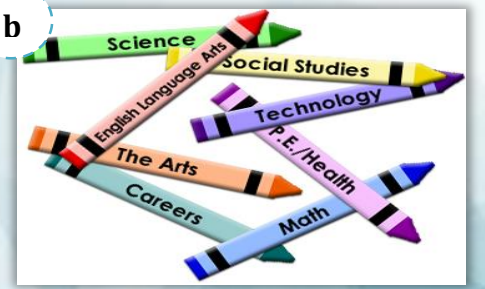
Visual Hints

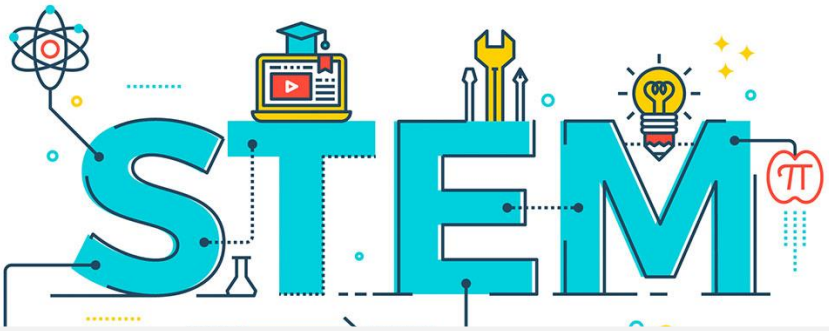
Look at the following pictures. Try to match each picture with the relevant noun from the box below.

Disciplines **Occupations**

a

b





READING

STEM

A. ……

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"The future of the economy is in STEM," says James Brown, the *executive* director of the STEM Education *Coalition* in Washington, D.C. That is where the jobs of tomorrow will be. Data from the US *Bureau* of Labor Statistics (BLS) support that idea. Employment in careers related to STEM – science, technology, engineering, and mathematics – is projected to grow to more than 9 million between 2012 and 2022. That is an increase of about 1 million jobs over 2012 employment levels.

Overall, STEM occupations are projected to grow faster than the average for all occupations. And wages in these occupations were generally higher than the median for all occupations in May 2013. BLS projects overall STEM employment to grow about 13 percent between 2012 and 2022. This is faster than the 11-percent rate of growth projected for all occupations over the decade. But projected employment growth varies by occupation. Some of these occupations are in technology; others are related to math and engineering (See table 1). BLS data show that workers in the STEM occupations earned a median annual wage of nearly $76,000 – more than double the $35,080 median wage for all workers in May 2013. Many of the top-paying occupations are related to engineering.

B. ……

STEM work, like that of most jobs, is both rewarding and challenging. You might work on an interesting project that yields meaningful results, for example – but, to complete it, you might need to repeat an experiment many times or navigate complex government regulations.

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Many STEM workers find their jobs *intellectually stimulating*. They enjoy collaborating with people who share their enthusiasm and working with cutting-edge technology. STEM offers a cooperative, innovative, and exciting work environment that

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is *unparalleled*. Depending on the occupation, STEM work may be creative and produce *tangible* results. For example, a biologist might make a discovery in the laboratory and publish that research in a scientific journal. A civil engineering technician may help design a storage facility or other structure and then assist in working with the contractor who builds it.

Table 1. Selected STEM occupations with fast employment growth, projected 2012–22

Occupation	Employment growth, projected 2012–22 (percent)	Employment		Median annual wage, May 2013	Typical entry-level education[1]
		2012	Projected 2022		
Information security analysts[2]	37%	75,100	102,500	$88,590	Bachelor's degree
Operations research analysts	27	73,200	92,700	74,630	Bachelor's degree
Statisticians	27	27,600	34,900	79,290	Master's degree
Biomedical engineers	27	19,400	24,600	88,670	Bachelor's degree
Actuaries[3]	26	24,300	30,600	94,340	Bachelor's degree
Petroleum engineers	26	38,500	48,400	132,320	Bachelor's degree
Computer systems analysts	25	520,600	648,400	81,190	Bachelor's degree
Software developers, applications	23	613,000	752,900	92,660	Bachelor's degree
Mathematicians	23	3,500	4,300	102,440	Master's degree
Software developers, systems software	20	405,000	487,800	101,410	Bachelor's degree
Computer user support specialists[4]	20	547,700	658,500	46,620	Some college, no degree
Web developers	20	141,400	169,900	63,160	Associate's degree
Civil engineers	20	272,900	326,600	80,770	Bachelor's degree
Biological science teachers, postsecondary	20	61,400	73,400	75,740	Doctoral or professional degree
Environmental science and protection technicians, including health	19	32,800	38,900	41,700	Associate's degree

[1] Unless otherwise specified, occupations typically require neither work experience in a related occupation nor on-the-job training to obtain competency.
[2] In addition to the education specified, this occupation typically requires less than 5 years of work experience in a related occupation.
[3] In addition to the education specified, this occupation typically requires long-term on-the-job training for workers to obtain competency.
[4] In addition to the education specified, this occupation typically requires moderate-term on-the-job training for workers to obtain competency.
Source: U.S. Bureau of Labor Statistics, Employment Projections program (employment, projections, and education data) and Occupational Employment Statistics survey (wage data).

Workers in STEM occupations also enjoy the variety of problems they solve. Every problem is a *unique* challenge to figure out. Even if you use similar skills, the way you apply them is different. Because many STEM fields involve rapid change, workers' professional development is also dynamic. There is always something more to learn. Do not expect an end. However, as rewarding as STEM work may be, it can sometimes be demanding and *tedious*. For example, projects may take hundreds of hours over weeks or months to complete. And routine tasks may include cataloging data, filling out paperwork, and documenting observations.

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C. ……

Along with having a technical foundation, prospective STEM workers must have strong thinking and communication skills. People focus so much on math and science that they often ignore these skills. Ability to consider problems in different ways and then being able to explain a solution clearly is essential for success in STEM occupations. Critical and creative thinking also help STEM workers in problem solving to detect mistakes, gather relevant information, and understand how different parts or systems interact with each other. STEM workers also need thinking skills to develop innovative, cost-effective solutions. Workers who think creatively may approach a problem differently – for example, by *adapting* knowledge from other *disciplines*.

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Communication skills are important too for working well with others and conveying information clearly, both orally and in writing. Flaws in communication are a common source of conflict. You will usually work with or for someone else, so having these skills will make you stand out. Communication skills include technical writing, public speaking, interpersonal communication, and the ability to explain difficult concepts simply. Learning some of these skills may seem intimidating at first, but practice helps.

D. ……..

Many STEM occupations require at least a bachelor's degree. More technical and advanced jobs, including those in research, usually require a master's or doctoral degree. But STEM is not only for people who have a bachelor's or graduate degree. Many occupations typically require an *associate*'s degree, and a small number require either some college but no degree or a high school diploma or *equivalent*.

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In some STEM occupations, work experience in a related occupation is required at the entry level. For example, computer and information systems managers usually need at least 5 years of experience, first honing their technical skills in lower-level roles before moving to management. Even in occupations that do not require it, however, work experience often sets you apart. Companies want to bring you up to speed so you can be productive quickly. But there are so many skills you do not learn in school that you can only learn on the job. STEM workers advise you to look for internship, volunteer, and research opportunities as early as possible. Getting experience before graduation can help you determine whether a STEM career will be right for you. It is important to find something that excites you because working in STEM means making an investment in a passion.

As you broaden your experience, you should also broaden your network. Your network is more important than your *résumé* and should include mentors, business *colleagues*, and instructors. Develop a network by meeting people through work, volunteer, and internship positions; joining a club or working on a research project; and participating in job fairs, industry events, and online discussion boards.

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TECHNICAL CHECK

A. Recalling Information. Choose the best option for the following items.

1. Which one of the following is NOT true about STEM occupations?
a) They will experience a high raise in future.
b) Their average salary will be higher in comparison with other jobs.
c) They will grow 13 percent more than other occupations.
d) Not all of them require an academic degree.

2. It can be inferred that ……..
a) STEM workers need thinking skills more than a technical foundation.
b) Between 2012 and 2022, most top paying jobs will be in engineering.

c) The employment level in 2012 must have been about 8 millions.
d) Rapid change in STEM work requires workers to keep updated.

3. According to the passage, ……..
a) STEM jobs related to math enjoy a better situation than other STEM jobs.
b) Work experience is of significance in most STEM occupations.
c) You need at least a bachelor's degree to be able to apply for an STEM job.
d) STEM work may sometimes be very boring.

4. According to the text, which of the following qualifications is NOT mentioned in the text as necessary for most STEM occupations?
a) Thinking skills
b) Communication skills
c) Experience and internship
d) An academic degree

5. What is the main idea for the last paragraph?
a) Developing relations with others in the profession is very important.
b) You should strengthen your resume through a number of activities.
c) You need to be involved in a variety of activities in order to keep up-to-date.
d) Working on a research project or participating in job fairs can help you develop your skills.

B. Statement Accuracy. Decide if the following statements are True (T), False (F), or Not Given (NG).

1. All STEM jobs are predicted to equally grow in future. ……..
2. STEM workers are earning twice more than workers in other occupations ……..
3. STEM jobs are more stimulating than other jobs. ……..
4. Technical foundation and thinking and communication skills are all equally important. ……..
5. It is important that you start an internship soon after you graduate in an STEM job. ……..
6. BLS is responsible for STEM job education in the United States. ……..

QUESS IT UP

In previous chapters, it was explained that when attempting to decode the meaning of a new word, it is often useful to look at what comes before and after that word. The surrounding words can give readers helpful context clues about the meaning and structure of the new word, as well as how it is used. A number of examples and a description of the clue types in the context were also given in chapter four. Please review them if you feel it is necessary. Now try to guess the meaning of the following words from the context using the clues

provided in the surrounding words. You need to tell others how you could guess the meaning of each word.

1. "The future of the economy is in STEM," says James Brown, the executive director of the STEM Education Coalition in Washington, D.C. "That's where the jobs of tomorrow will be." Data from the U.S. Bureau of Labor Statistics (BLS) support that ***assertion***. Employment in occupations related to STEM—science, technology, engineering, and mathematics—is ***projected*** to grow to more than 9 million between 2012 and 2022. That's an increase of about 1 million jobs over 2012 employment levels.
2. A civil engineering technician may help design a storage facility or other structure and then ***assist*** in working with the contractor who builds it.
3. Workers in STEM occupations also enjoy the variety of problems they solve. Every problem is a unique ***challenge*** to figure out.
4. Communication skills are important too for working well with others and ***conveying*** information clearly, both orally and in writing. ***Flaws*** in communication are a common source of ***conflict***.

LANGUAGE FUNCTION: PARALLEL CONSTRUCTION IN A NUTSHELL

What is Parallel Construction?

Parallel ideas must be presented in parallel grammatical forms. Parallel grammatical form or parallel construction means that each part of a sentence uses the same grammatical structure. In other words, you need to use the same pattern of words to show that two or more ideas have the same level of importance. This can happen at the word, phrase, or clause level. The usual way to join parallel structures is with the use of coordinating conjunctions such as "and" or "or."

Examples of Parallel Construction

And/or

- **Incorrect:** *The production manager was asked to write his report quickly, accurately, and in a detailed manner.*
- **Correct:** *The production manager was asked to write his report quickly, accurately, and thoroughly.*

Between and And

- **Incorrect:** *We debated the difference between the weather in Kurdistan in the winter and how hot it is in the summer.*
- **Correct:** *We debated the difference between the weather in Kurdistan in the winter and the weather in Kurdistan in the summer.*

Both and And

- **Incorrect:** *The films were enjoyable to watch and discuss.*
- **Correct:** *The films were enjoyable to watch and to discuss.*

Neither and Nor; Either and Or

- **Incorrect:** *Neither the responses to the questionnaire nor what we asked on the survey were answered.*
- **Correct:** *Neither the responses to the questionnaire nor the responses to the survey were answered.*

Not Only and But Also

- Incorrect: *It was surprising not only that the house sold, but also it sold well over the asking price.*
- **Correct:** *It was surprising not only that the house sold but also that it sold well over the asking price.*

Parallel Construction in a Series

Sentences with series, or lists, require particular attention to parallel construction.

- **Incorrect:** The students were unprepared, poorly behaved, and disrupted the class.
- **Correct:** The students were underprepared, poorly behaved, and disruptive.

Now, the series has parallel elements (underprepared, behaved, and disruptive are all adjectives).

Practice

LANGUAGE FUNCTION

Practice A. In the four sentences below, circle the correct word or phrase that gives the sentence correct parallel structure.

1. Justin was excited about inviting friends over, eating a good meal, and ……
   a) a game.
   b) to play.
   c) playing a game.
2. I have always enjoyed reading the book more than ……
   a) I watched the movie version.
   b) watching the movie.
   c) to watch the movie.
3. When the weather outside is cold and ……., I like to be indoors.
   a) starting to get windy
   b) windy
   c) getting windy
4. Running, lifting, and ……. are three of Ashley's favorite exercises.
   a) racquetball
   b) a spinning class
   c) bicycling

Practice B. In the sentences below, write a word or phrase in the blank that gives the sentence parallel structure.

1. The little girl liked eating cookies better than …….. at her grandmother's house.
2. Students like to sleep, relax and …….. During the summer.
3. He went to the store to pick up a carton of milk and two …….. .
4. Food, shelter, and …….. are all I need to survive on a deserted island.
5. …….. is much better than a visit to the dentist.

Practice C. Correct the nonparallel elements in the following sentences.

1. The Budget Information System is a query system, the database is small, and we need to recognize the fact that the response time is unacceptably long.
   ……
2. Recreation users inflict many wounds by pounding nails into trees, lantern burns, and damaging their roots with vehicles and heavy equipment.
   ……
3. Declaring sustainability as a goal is one thing; putting it into operation has been an elusive goal.
   ……
4. The room was beautiful, the service impeccable, and I've never tasted better food in my entire life.
   ……

5. You are not only responsible for organizing the conference, but we also want you to introduce the keynote speaker.
   ……

WRITING ESSENTIALS

As the name might suggest, a narrative paragraph tells a story. Therefore, you need to have a sequence for the story or the action that happened i.e., a clear beginning, a middle, and an end. When writing a narration, it is highly recommended to include descriptive language to help readers get a feeling for what happened. Here are some suggestions on how to make your writing more descriptive:

1. **Use adjectives to modify nouns.** Nothing is more boring than a sentenced such as '*We went to the store*.' It's easy to modify store to be more precise as well as descriptive. '*We went to a big box electronics store*' is much more interesting.
2. **Use prepositional phrases** such as *in the corner* and *across from* to give an idea of where something happens, as well as the relationships between objects:
   After we arrived, we were shown to our table at the back of the restaurant.
   The car was parked around the corner on the other side of the street.
3. **Use relative clauses** to further describe and provide information about important details in your narration:
   Next, we took the car which we had rented in Rome and drove to Palermo.

WRITE IT UP (SELF PRACTICE)

Practice A. Now that you have a good feeling for the form of a narrative paragraph. Fill in the gaps in this paragraph providing appropriate linking language to complete the paragraph.

…… I drove my rusty old car to visit my best friend. …… I arrived, he had done his best to prepare a tasty meal. ……., we took a long walk through the park next to his home. …… we had been out for more than an hour, my friend asked me if I could keep a secret. ……., I swore not to tell anyone anything. …… he told me he had met the woman of his dreams and that they were to get married …… Imagine my surprise!

Practice B. Rewrite the following sentences using descriptive language to spice up your writing.

1. He had finished the report before I gave the presentation.
2. The children attended the class.
3. My friends asked for help.

SEMI/TECHNICAL VOCABULARY SELF STUDY

Chapter 6 Word List. The main words in this chapter are listed here. You can check your vocabulary knowledge by providing relevant meaning(s) or synonyms for each.

Adapt: .....
Annual: .....
Associate's degree: .....
Bachelor's degree: .....
Broaden: .....
Bureau: .....
Civil engineering: .....
Collaboration:.....
Colleague: .....
College: .....
Conflict: .....
Contractor: .....
Convey: .....
Cooperate: .....
Cost-effective: .....
Critical: .....
Discipline: .....
Employment: .....
Enthusiasm: .....
Equivalent: .....
Essential: .....
Executive: .....
Figure out: .....
Flaw: .....
Foundation: .....
Graduate degree:.....
Ignore: .....
Instructor: .....
Intellectually: .....
Interact: .....
Internship: .....
Intimidating: .....
Investment: .....
Master's degree: .....
Median: .....
Mentor: .....
Occupation: .....
Orally: .....
Project (v): .....
Prospective: .....
Regulation: .....
Resume: .....
Routine: .....
Stand out: .....
Storage: .....
Tangible: .....
Tedious: .....
Typically: .....
Unique: .....
Unparalleled: .....
Volunteer: .....
Wage: .....
Yield: .....