

● 高等职业教育“十二五”规划教材

实用科技英语

PRACTICAL ENGLISH FOR
SCIENCE AND TECHNOLOGY

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前言

自然科学和工程技术方面的科学著作、论文、教科书、科技报告和学术演讲中所使用的英语称为科技英语。随着全球经济一体化的逐步深入和日新月异的科学技术领域内的发展和创新,科技英语的重要作用日益凸现。

工程技术类专业外语属科技英语范畴。本书以提高学生科技英语的综合能力为目的,深化学生对相关专业领域新技术的认知。以国家示范高职院校对人才培养的要求为指导思想,从知识应用和技能培养的实际出发,并结合科技英语的教学实践,按照知识的认知规律编写了本书。

本书共14个单元,内容包括先进制造技术、机械设计与加工、数控原理及编程、航空航天技术、机电一体化技术、自动控制系统及自动生产线、典型工业控制器和软件、工业机器人、数字信号处理、虚拟仪器仪表、人机交互、虚拟现实、人工智能、物联网技术、电子商务等方面的英文材料。本书在强调专业知识的基础上,加强学生对科技文章词汇、结构、特点、语法的认识。使学生在学完结束后,在掌握专业词汇的基础上,能够独立阅读、检索、分析、撰写典型的科技文章。

本书每单元的阅读材料以摘要开篇,将材料设计成典型科技论文的形式,特色鲜明。各单元内容配以相关插图,图文并茂便于理解。各单元的课后习题着眼专业,帮助读者巩固所学知识。各单元均有泛读材料和科技英语知识链接,以提高科技英语的综合能力。每单元结束后还有设置的与课文内容相关的角色扮演,以提高学习兴趣。书后附有参考译文和习题答案,便于自学。本书各单元内容相对独立,各院校可根据专业具体情况自行选择教学内容。

本书以高等职业院校机械工程与自动化、机电一体化、数控技术、电气自动化、电子技术专业的专业基础课、专业课、专业选修课的教学为主,也可作为相关行业工程技术人员的参考书和学习手册。内容丰富

多样,体系完整,注重实用性和参考性。

本书由陕西国防工业职业技术学院吕栋腾(全书的知识连接)、孙永芳(11—14 单元)主编,陕西工业职业技术学院王永康(第 6 单元),陕西国防工业职业技术学院杨维(7—10 单元)、甘代伟(4—5 单元)、马艳(1—4 单元翻译)担任副主编,陕西国防工业职业技术学院谭波(1—3 单元)、马静(5—8 单元翻译),陕西工业职业技术学院吉武庆(9—11 单元翻译),欧姆龙中国自动化公司王展(12—14 单元翻译),西安外国语大学伊薇(单词表和附录)担任参编。陕西国防工业职业技术学院修学强担任主审并对书中内容做最终校核。

本书编写过程中参考和引用了大量的资料和文献,在此向本书所参考和引用的资料和文献作者及西北大学出版社的大力支持和帮助表示衷心感谢。

由于编者水平所限,书中疏漏在所难免,恳请广大读者和专家批评指正。

编 者

2013 年 2 月

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Unit 1

Reading Material



3D Printing

ABSTRACT: The industrial revolution of the late 18th century made possible the mass production of goods, thereby creating economies of scale which changed the economy and society in ways that nobody could have imagined at the time.^[1] Now a new manufacturing technology has emerged which does the opposite. Three-dimensional printing makes it as cheap to create single items as it is to produce thousands and thus undermines economies of scale.^[2] It may have as profound an impact on the world as the coming of the factory did.

KEY WORDS: 3D printing; production; principle

The term “3D printing” was coined at MIT in 1995 when graduate students Jim Brecht and Tim Anderson modified an inkjet printer to extrude a binding solution onto a bed of powder, rather than ink onto paper (Fig. 1—1). The ensuing patent led to the creation of modern 3D printing companies Z Corporation (founded by Brecht and Anderson) and ExOne.

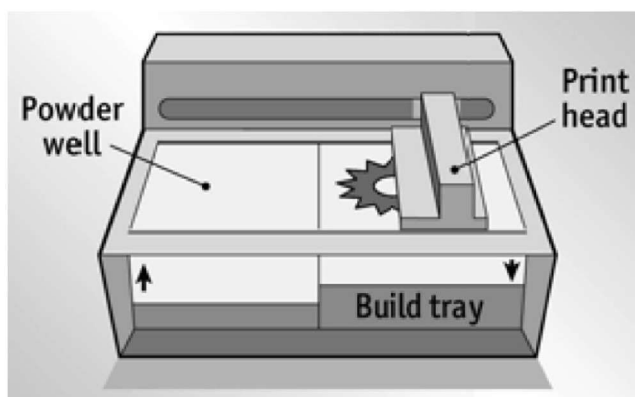


Fig. 1—1 The principle model of 3D printer

It works like this. First you call up a blueprint (digital model) on your computer screen and tinker with its shape and color where necessary. Then you press print. A machine nearby whirrs into life and builds up the object gradually either by depositing material from a nozzle, or by selectively solidifying a thin layer of plastic or metal dust using tiny drops of glue or a tightly focused beam.^[3] Products are thus built up by progressively adding material, one layer at a time, hence the technology's other name, additive manufacturing. Eventually the object in question—a spare part for your car, a lampshade, a violin—pops out. (Fig. 1—2) The beauty of the technology is that it does not need to happen in a factory. Small items can be made by a machine like a desktop printer, in the corner of an office, a shop or even a house; big items like bicycle frames, panels for cars, aircraft parts need a larger machine, and a bit more space.



Fig. 1—2 The components through 3D printing

The additive approach to manufacturing has several big advantages over the conventional one. It cuts costs by getting rid of production lines. It reduces waste enormously, requiring as little as one-tenth of the amount of material. It allows the creation of parts in shapes that conventional techniques cannot achieve, resulting in new, much more efficient designs in aircraft wings or heat exchangers, for example. It enables the production of a single item quickly and cheaply—and then another one after the design has been refined.

At the moment the process is possible only with certain materials (plastics, resins and metals) and with a precision of around a tenth of a millimeter. As with computing in the late 1970s, it is currently the preserve of hobbyists and workers in a few academic and industrial niches. But like computing before it, 3D printing is spreading fast as the

technology improves and costs fall. A basic 3D printer, also known as a fabricator or “fabber”,^[4] now costs less than a laser printer did in 1985.

The technology will have implications not just for the distribution of capital and jobs, but also for intellectual-property (IP) rules. When objects can be described in a digital file, they become much easier to copy and distribute. Just ask the music industry. When the blueprints for a new toy, or a designer shoe, escape onto the internet, the chances that the owner of the IP will lose out are greater.

Just as nobody could have predicted the impact of the steam engine in 1750, or the printing press in 1450, or the transistor in 1950, it is impossible to foresee the long-term impact of 3D printing. But the technology is coming, and it is likely to disrupt every field it touches. Companies, regulators and entrepreneurs should start thinking about it now. One thing, at least, seems clear: although 3D printing will create winners and losers in the short term, in the long run it will expand the realm of industry.

Words and Expressions

modify ['mɒdɪfaɪ] *v.* 修改, 更改

extrude [ɪk'strud] *v.* (被)挤压出; 喷出

patent ['pætnt] *n.* 专利; 专利品

beam [bi:m] *n.* 梁; 光线; (电波的)波束

frames [freɪmz] *n.* 框架; 边框

hobbyist ['hɒbɪst] *n.* 沉溺于某种癖好者

academic [ækə'demɪk] *adj.* 学院的, 大学的, 学会的

niches [nɪtʃɪz] *n.* 合适的位置

resin ['rezɪn] *n.* 树脂; 松香

replica ['replɪkə] *n.* 复制品

3D printing 三维打印

digital model 数字模型

Special Difficulties

1. The industrial revolution of the late 18th century made possible the mass production of goods, thereby creating economies of scale which changed the economy and society in ways that nobody could have imagined at the time.

thereby: 由此, 从而的意思。本句可译为: 18 世纪晚期的工业革命使商品的大规模生

产成为可能,从而创造了规模经济,当时没人能想象到它对经济、社会所产生的影响程度。

2. Three-dimensional printing makes it as cheap to create single items as it is to produce thousands and thus undermines economies of scale.

句中 as... as...,表示单件生产跟规模生产一样便宜。

3. A machine nearby whirrs into life and builds up the object gradually, either by depositing material from a nozzle, or by selectively solidifying a thin layer of plastic or metal dust using tiny drops of glue or a tightly focused beam.

whirrs into life,带着轻微的响声进入工作状态。比如: Suddenly the hall burst into life. 大厅突然活跃起来。 The fire flared into life. 火旺了起来。

4. fabber

一个免费的开源的快速成型机的名字,任何人都可以去他们的网站 fabathome 下载,制作快速成型机 fabber 的资料。

Learn and Practice

1. Mark the following statements with T (true) or F (false) according to the text.

(1) The industrial revolution of the late 18th century made the mass production of goods impossible. ()

(2) The process of 3D printing is possible only with plastics. ()

(3) We have predicted the impact of 3D printing. ()

2. Choose the best choice according to the text.

(1) It works like this. First you call up a blueprint, a () model on your computer screen and tinker with its shape and color where necessary.

A. digital B. code C. coded

(2) The ensuing patent () to the creation of modern 3D printing companies Z Corporation (founded by Bredt and Anderson) and ExOne.

A. led B. used C. made

(3) Products are thus built up by progressively adding material, one layer at a time; hence the technology's other name, () manufacturing.

A. additive B. cumulative C. additives

(4) The term "3D printing" was coined at () in 1995.

A. MIT B. Harvard C. Yale

(5) At the moment the process is possible only with certain materials (plastics, resins and metals) and with a precision of around a () of a millimeter.

A. 10th B. ten C. 100th

3. Translate the following phrases into Chinese or English.

Additive manufacturing

Intellectual-property (IP)

Long-term impact

Extensive Reading

Advanced Manufacturing Technology

Progress in human society has been accomplished by the creation of new technologies. The last few years have witnessed unparalleled changes throughout the world.^[1] Rapid changes in the markets demand drastically shortened product life cycles and high-quality products at competitive prices. Customers now prefer a large variety of products. This phenomenon has inspired manufacturing firms to look for progressive computerized automation in various processes. Thus mass production is being replaced by low-volume, high-variety production. Manufacturing firms have recognized the importance of flexibility in the manufacturing system to meet the challenges posed by the pluralistic market. The concept of flexibility in manufacturing systems has attained significant importance in meeting the challenges for a variety of products of shorter lead-times, together with higher productivity and quality. The flexibility is the underlying concept behind the transition from traditional methods of production to the more automated and integrated methods (Fig. 1—3). They stress that firms implementing automation projects should prioritize their needs for different flexibilities for long-range strategic perspectives.



Fig. 1—3 AMT in production

Numerous definitions of AMT exist. For example, Baldwin (1995) defines AMT as

a group of integrated hardware-based and software-based technologies, which if properly implemented, monitored, and evaluated, will lead to improving the efficiency and effectiveness of the firm in manufacturing a product or providing a service. AMT, defined broadly, is a total socio-technical system where the adopted methodology defines the incorporated level of technology. AMT employs a family of computer aided manufacturing (CAM), flexible manufacturing systems (FMS) (Fig. 1 — 4), manufacturing resource planning (MRP), automated material handling systems, robotics, computer numerically controlled machines (CNC), computer-integrated manufacturing (CIM) systems, optimized production technology (OPT),^[2] and just-in-time (JIT).^[3] Although AMT places great emphasis on the use of technological innovation, management's role is significant since AMT systems require continual review and readjustment.



Fig. 1—4 Flexible manufacturing system

The properties inherent in Advanced Manufacturing Technology (AMT) create new opportunities for firms and in particular small firms in the local context.^[4] The capability of this technology to modify production specifications quickly and accurately means that firms can customize their products and attain economics of scope based on low volume and low cost production. While traditionally technology has been perceived merely as a tool in implementing business strategy, AMT has the potential to directly affect the firm's strategy choices. To date, AMT literature suggests that adoption of AMT offers firms the potential to pursue new innovative strategies.

Words and Expressions

witness ['wɪtnɪs] *v.* 作证; 表示

- unparalleled** [ʌn'pærəleld] *adj.* 无比的, 无双的
- drastically** ['dræstikəli] *adv.* 彻底地, 激烈地
- phenomenon** [fi'nɒmɪnən] *n.* 现象, 事件
- inspired** [in'spaɪəd] *v.* 鼓舞; 激励
- pluralistic** [plʊərə'lɪstɪk] *adj.* 兼职的; 多元化的
- implementing** ['ɪmplɪməntɪŋ] *v.* 实现; 执行; 使生效
- prioritize** [praɪ'ɔːtaɪz] *vt.* 按重要性排列; 优先处理
- perceive** [pə'siːv] *v.* 感觉; 理解为
- integrated** ['ɪntɪɡreɪtɪd] *adj.* 完整的; 整体的; 结合的
- evaluate** [ɪ'væljueɪt] *v.* 评价; 求……的值(或数)
- efficiency** [ɪ'fɪjənsi] *n.* 效率; 能力
- methodology** [məθə'dɒlədʒi:] *n.* 方法学, 方法论
- incorporated** [ɪn'kɔːpəreɪtɪd] *adj.* (美) 股份有限公司的, 组成公司的
- optimize** ['ɒptəmaɪz] *adj.* 最佳化的, (使) 最优化的
- emphasis** ['emfəsis] *n.* 强调, 突出
- lead-times** 交付周期; 更换模具的时间
- to date** 到目前为止, 迄今

Special Difficulties

1. Progress in human society has been accomplished by the creation of new technologies. The last few years have witnessed unparalleled changes throughout the world.

The last few years 最近的几年, 也可以用 The past few years 过去的几年, 均表示完成时态, 后面省略主语。译为: 新技术的创新已经让人类社会取得了进步发展, 近几年世界发生了空前的有目共睹的变化。

2. Optimized Production Technology

最佳生产技术(OPT)是一种改善生产管理的技术, 以色列物理学家 Eli Goldratt 博士于 20 世纪 70 年代提出, 用于安排企业生产人力和物料调度的计划方法。

3. Just In Time 简称 JIT, 准时生产方式。

又称作无库存生产方式(stockless production), 零库存(zero inventories), 一个流(one-piece flow)或者超级市场生产方式(supermarket production)。

4. The properties (which was) inherent in Advanced Manufacturing Technology (AMT) create new opportunities for firms, and in particular small firms in the local context.

先进制造技术的内在优势会为企业,特别是局部地区的小企业创造新的机会。

Learn and Practice

1. Mark the following statements with T (true) or F (false) according to the text.

- (1) Customers prefer a large variety of products nowadays. ()
- (2) Most manufacturing firms have not recognized the importance of flexibility in the manufacturing system. ()
- (3) There is only one definition of AMT. ()

2. Translate the following passage into Chinese.

Owing to the intense global competition in manufacturing, manufacturers need to increase their level of competitiveness in the global market. Some manufacturing companies, therefore, are forced to undergo a period of transformation in order to compete more effectively. Under these circumstances, AMT is considered as a means of improving competitiveness.

Knowledge Link for Scientific English

科技英语的阅读方法和技巧

在科技英语的阅读理解中,文章的难度主要表现在语言、词汇、题材内容上。要把科技文章的内容读懂,对文中的信息进行综合加工、概括归纳,然后得出结论。因此它和一般意义上的普通英语文章阅读相比,难度要大得多。本章节将在分析阅读理解过程的基础上,结合阅读实例总结科技文章的阅读方法和技巧。

一、科技英语阅读方法

所谓阅读,实际上就是语言知识、语言技能和智力的综合运用。在阅读过程中,这三个方面的作用浑然一体、相辅相成。词汇和语法结构是阅读所必备的语言知识,但仅仅如此是难以进行有效阅读的,学生还需具备运用这些语言知识的能力,即根据上下文来确定准确词义和猜测生词词义的能力,辨认主题和细节的能力,正确理解连贯的句与句之间、段与段之间的逻辑关系的能力。这里所指的智力是学生的认知能力,包括记忆、判断和推理的能力。因为在阅读科技英语文章时常常要求领悟文章的言外之意和作者的态度、倾向等。阅读理解能力的提高是由多方面因素决定的,学生应从以下三个方面进行训练。

1. 打好语言基本功

扎实的语言基础是提高阅读能力的先决条件。首先,词汇是语言的建筑材料。提高科技英语资料的阅读能力必须扩大词汇量,尤其是掌握一定量的科技英语词汇。如词汇量掌握得不够,阅读时就会感到生词多,不但影响阅读的速度,而且影响理解的程度,从而不能进行有效的阅读。其次,语法是语言中的结构关系,用一定的规则把词或短语组织到句子中,表示一定的思想。熟练掌握英语语法和惯用法也是阅读理解的基础。在阅读理解中必须运用语法知识来辨认出正确的语法关系。如果语法基础知识掌握得不牢固,在阅读中遇到结构复杂的难句、长句,就会不知所措。

2. 在阅读实践中提高阅读能力

阅读能力的提高离不开阅读实践。在打好语言基本功的基础上,还要进行大量的阅读实践。词汇量和阅读能力的提高是一种辩证关系:要想读得懂,读得快,就必须扩大词汇量;反之,要想扩大词汇量,就必须大量阅读。同样,语法和阅读之间的关系也是如此:有了牢固的语法知识就能够促进阅读的顺利进行,提高阅读的速度和准确率;反之,通过大量的阅读实践又能够巩固已掌握的语法知识。只有在大量的阅读中,才能培养语感,掌握正确的阅读方法,提高阅读理解能力。同时在大量的阅读中,还能巩固专业知识及了解高新技术的发展趋势,这对于跟踪科学技术的发展很有好处。

3. 掌握正确的阅读方法

阅读时,注意每次视线的停顿应以一个意群为单位,而不应以一个单词为单位。要是每个单词都读,当读完一个句子或一个段落时,前面读的是什么早就忘记了。这样读不仅速度慢,还影响理解。因此,采用正确的阅读方法可以提高阅读速度,同时提高阅读理解能力。常用的有效阅读方法有三种,即略读(skimming)、浏览(scanning)、精读(intensive reading)。

(1) 略读(skimming)

略读是指以尽可能快的速度进行阅读,了解文章的主旨和大意,对文章的结构和内容获得总的概念和印象。一般地说,400字左右的短文要求在(6—8) min 完成。进行略读时精力必须特别集中,还要注意文中各细节分布的情况。略读过程中,读者不必去读细节,遇到个别生词及难懂的语法结构也应略而不读。不要逐词逐句读,力求一目数行而能大概知道含义。略读时主要注意以下几点:

- 1) 注意短文的开头句和结尾句,力求抓住文章的主旨和大意;
- 2) 注意文章的体裁和写作特点,了解文章结构;
- 3) 注意了解文章的主题句及结论句;
- 4) 注意支持主题句或中心思想的信息句,其他细节可以不读。

在时间有限而又不想仔细了解一篇文章的总内容时,就常常需要进行略读。与浏览不同,略读不需要寻找特定的数目和名称,只是制定主题;所以进行略读的一种方法就是判定可能的主题句。在英语文章的段落中通常包含着本篇文章主题中的某一方面的信

息。而每一段的第一句话往往就是了解这一段落内容的线索,这样的句子就是主题句。

(2) 浏览(scanning)

浏览的目的主要是要有目的地去找出文章中某些特定的信息,也就是说,在对文章有所了解的基础上,在文章中查找与某一问题、某一观点或某一单词有关的信息。浏览时要以很快的速度扫视文章,确定所查询的信息范围,注意所查信息的特点,如有关日期、专业词汇、某个事件、某个数字、某种观点等,寻找与此相关的关键词或关键段落。注意与所查信息无关的内容可以略过。

浏览和略读一样也是非常重要的阅读技巧。所不同的是,略读使你对一篇文章或一本书籍的内容获得一个总的了解,而浏览可以帮助你得到你想得到的特定信息。在你已经知道一篇文章或一本书籍的大概内容后,而你又想从中得到你对某些特定问题的答案时,就可以应用浏览方式。浏览使你或者进行选择性阅读,或者只是得到特定信息。在通过对文章的题目、副标题和主题句进行略读后,你或者浏览你所感兴趣的段落,或者浏览整篇文章了;但注意力只集中在你感兴趣的特定信息上。

一般我们在阅读科技文章的时候采用略读加浏览的阅读方法,可以提高阅读效率。此种方法也适用于各类英语等级考试。在进行针对性训练后可以节省时间,提高做题速度。

(3) 精读(intensive reading)

精读是指仔细地阅读,力求对文章有深层次的理解,以获得具体的信息,包括理解衬托主题句的细节,根据作者的意图和中心思想进行推论,根据上下文猜测词义等。对难句和长句要借助语法知识对其进行分析,达到准确的理解。总之,要想提高阅读理解能力必须掌握以下六项基本的阅读技能:

- 1) 掌握所读材料的主旨和大意;
- 2) 了解阐述主旨的事实和细节;
- 3) 根据上下文判断某些词汇和短语的意义;
- 4) 既理解个别句子的意义,也理解上下文之间的逻辑关系;
- 5) 根据所读材料进行一定的判断、推理和引申;
- 6) 领会作者的观点、意图和态度。

二、科技英语阅读技巧

科技英语阅读对于大中专院校的学生和从事生产研发的技术人员都是十分重要的。不同的读者在阅读科技文章时有不同的方法和技巧,但作为科技文献阅读本身总是存在一定的规律,有普遍通用的方法和技巧可以遵循。

1. 紧抓主题思想

作者通常都是围绕一个主题思想来组织写作材料的。许多读者在获取主题思想方面有困难。或许我们都遇到过这样的情形,谈话中双方在进行争论,但是似乎任何一方都没

有抓到对方的要点。与此非常相似的是,或许我们看过一段文章后还不明白作者究竟在说什么。我们可以把获取主题思想的阅读技巧分为以下四步:

(1) 辨认主题名词

就大多数文章而言,获取主题思想的第一步就是要确定一个最能描述作者思想中的某个人、某个地方或某件事的名词,这样的—个名词(有时是一个短语)就是主题名词。

Rocks found on the surface of the earth are divided into three classes: igneous, sedimentary, and metamorphic. Molten material becomes igneous rock when it cools. Sedimentary rocks are formed from materials deposited by glaciers, plants, animals, streams, or winds. Metamorphic rocks are rocks that once were igneous or sedimentary but have changed as a result of pressure, heat, or the deposit of material from solution.

Topic noun: rocks; igneous; sedimentary; metamorphic

(2) 找出主题句

一个段落的主题句就是最能表达作者的主题思想的句子,多数情况是主题句位于句首,也可位于句尾,少数位于句中。

(3) 获取主题思想

在获取主题思想时,读者容易出现将主题的某一小部分看做是主题思想,或概括的内容过多超过了作者所表达的主题思想的范围的,这两种理解都是错误的。结合本单元补充阅读材料归纳文章主题思想。

(4) 避免不相关的内容

读者在获取主题思想时所犯的另一个普遍错误就是头脑中出现一些与文章主题思想不相同的概念,并把它们看做是文章的主题思想。在阅读文章之前读者有可能对作者表述的主题方面已有一些了解。如果读者过多地考虑已了解的那些内容,而不充分地关注作者所阐述的思想的话,就容易形成与文章的主题思想不相关的主题思想,尽管它本身的内容是真实的。总而言之,不能先入为主,不能用自己的想法代替文章的主题思想。试判断下面段落的主题思想是否与作者观点相符。

1) Movies are actually separate still pictures shown so fast that the human eye cannot detect the break between them. When successive images are presented rapidly enough, we fuse them into single moving image.

- a. Movies are extremely popular.
- b. Modern movies make much use of slow motion.
- c. Motion pictures are separate pictures shown so fast that we see no break between them.
- d. Motion pictures require an expensive camera, capable of making very rapid multiple exposures.

2. 获取文章细节