

INDUSTRIAL ARTS AND TECHNOLOGY, BEST QUOTES ON

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INDUSTRIAL ARTS & TECHNOLOGY PROGRAM

We have a new generation that is tool illiterate. Most young people don't have any idea how to use a crescent wrench or even a hammer. It's going to affect society. It's such a shame that school systems took away shop classes. Kids graduate from high school now without the ability to read a ruler. If you can't read a ruler, how are you going to measure anything? If you can't measure anything, how can you get a job making anything?

—John Ratzenberger

One only needs two tools in life: WD-40 to make things go, and duct tape to make them stop.

—G. M. Weilacher

There is a missing link in the chain of education and training that runs from the elementary school to the university doctoral thesis. This missing link has resulted in a void in our manpower resources that is becoming more critical every day. The missing link is an advanced, more sophisticated technical education that combines the abilities of the mind with the capabilities of the hands. The void in manpower resources is the lack of a class of personnel sufficiently hand-skilled to translate abstract ideas into three-dimensional reality.

—C. A. Widen

I think it's a real shame so many schools have taken out the hands-on classes. Art, music, auto mechanics, cooking, sewing, these are all things that can turn into jobs. You know, wood shop, steel shop, welding. These are all things that can turn into great careers, get kids interested. How can you get interested in these careers if you don't try them on a little bit?

—Temple Grandin

The man who uses his hands is a laborer. The man who uses his mind is a master. But the man who gives his heart to the passion is a craftsman.

--Nadir Güllü

Let's not be so elitist that we can't honor good, hard, dignified, ennobling work: people working with their hands, building things, putting up solar panels, weatherizing homes, working on organic agriculture, building wind farms. We don't have robots in society, so somebody has to do that work. Let's make sure that the people who can use that work get a chance to do it. I see that as a first step toward bigger and better things.

—Van Jones

Industrial arts education is devoted to the interpretation of industry, which is the most dominant characteristic of our society. Industrial arts education helps all kinds of students to prepare for living in an industrial democracy and provides a foundation for specific occupational and educational opportunities. Industrial arts gives basic education for the technician, engineer, scientist, and for the several occupational education programs. Rather than being confined to the learning of a specific trade or skill which may be obsolete within a few years, today's concept of industrial arts emphasizes transferable skills and knowledge so that boys and girls may become more flexible and versatile in this rapidly changing world. By receiving basic information on the total scope of industry, students understand the necessity to equip themselves for future adjustment to employment changes due to scientific and technological innovations.

—Kenneth E. Dawson

70 million baby boomers, some highly skilled, will exit the work force in the next 18 years, with only 40 million workers coming in....Throughout the entire economy the United States lacks adequate numbers of appropriately skilled workers to support high standards in personal or professional services, or properly maintain the physical and technological infrastructure upon which everyone relies and takes for granted.

—Edward Gordon

Manufacturing, construction, auto repair jobs, and dozens of other industries are feeling the...pinch of hiring and retaining sufficient trained workers. There is, however, a larger context to the problem...the state has sorely neglected vocational education in the popular, if wrongheaded, drive to direct every high school student into college, even though no more than a fifth of high school graduates will, in fact, obtain four-year degrees. A recent survey by the *Public Policy Institute of California* found that nearly two-thirds of Californians believe that someone must have a college education to succeed, which is patently wrong, as the highly paid technical and blue-collar jobs now going begging attest. Politicians and the education establishment feed that canard through policies that elevate college preparation above all other considerations....

At the same time, however, California is losing millions of potential replacements for those aging baby boom workers by allowing nearly a third of high school students to drop out without obtaining diplomas.

—Dan Walters

We have, in one California assemblyman's words, 'denigrated the vocational worker.' Vocational workers are no longer viewed as making valued contributions to society, yet this year in the U.S. we are short 35,000 machinists, 48,000 construction workers, and, in California alone, 2,500 automobile technicians. The U.S. is desperate [for these] skills....These skills used to be taught to some degree in every high school. The need for manual skills was recognized for decades as something that should be taught in secondary schools. To be a trained machinist, auto mechanic, welder, ship fitter, or other skilled laborer was viewed in a different light from what it is today.

—James Howlett and
Brad Huff

The push to prepare all students for college has resulted in the near disappearance of high school industrial arts courses. This unfortunate trend endangers the future of both non-college-bound students and the U.S. as a whole.

—James Howlett and
Brad Huff

One theory of the birth of Industrial Arts is that of cultural industrial education. It all started at the turn of the twentieth century (1904), during the peak of the Industrial Revolution. Parents wanted their children to be able to read, write, and have some ability to apply math skills. A minority went further and wanted their children to have knowledge of history, civics, and the sciences. One thing was sure, that all parents of that day felt anxious and feared that their children would not become self-supporting after completing school. It is important, the public cried, that our children be trained for vocational life. Industry also required, even demanded from the educational system students that had higher abilities suited for vocational life in industry upon leaving school.

—Christian Misner

It is an assured fact that our boys and girls do not enter industrial life with the same confidence that they exhibit in other fields for which their academic training has fitted them. They see no fascination in industrial activity and they have no basis of judgment for choosing any particular career.

—J. E. Russell (1909)

Industrial Arts' major innovation was in the form of curriculum. It still taught manipulative skills, but it required its students to ask questions and problem solve and to investigate matters of industrial business. Industry helped solidify the new concept with its demands. Students needed to have knowledge in the new technology of that era. The major change in curriculum was that it offered social involvement. As the nation grew, so must the student understand what was fueling that growth so that they have the ability to contribute to the source of revenue. The vehicle used to complete this requirement was through an expanding education for the students. This included such topics as, but not limited to, Electricity, Transportation, Plastics, Textiles, and Construction. The collective effort of Agriculture, Industry, and Education helped build the foundation for what we knew as 'Industrial Arts.' In other words, the student needed skills that made them marketable. Consequently, the student needs to understand that social technology is ever changing. Industrial Arts curriculum could be summed up by the following quote credited to Frederick G. Bonser and Lois Coffey Mossman in 1923, 'Industrial Arts is a study of the changes made by man in the form of materials to increase their value, and of the problems of life related to these changes.'

—Christian Misner

Clear thinking, reasoning, creative thinking, problem solving (call it what you may) is a far more important basis of educational objectives in the lives of thirteen, fourteen, and fifteen year-old boys than one centered on skills and information.

—John P. Friese

An ancient Chinese proverb says, ‘I hear, and I forget. I see, and I remember. I do and I understand’. This proverb could have been the motto for the Industrial Arts movement. Industrial Arts’ main objective was to prepare students for the work force by teaching them to do and to understand why they were doing. It was the responsibility of schools to lead all students to understand the industrial and technical world in which they lived in.

—Christian Misner

The meaning of ‘industrial arts’ was written seventy years ago by Frederick Gordon Bonser and Lois Coffey Mossman of *Teacher’s College at Columbia University*. Characterizing this definition as ‘famous’ and ‘widely accepted,’ credited Bonser with leading a major thrust to redirect industrial arts away from activities and studies based on discrete materials or selected trade skills and toward broader conceptualizations such as how humankind provides itself with clothing, food, and shelter. The definition has three major elements: education, technology, and society. Industry is not mentioned.

—Patrick N. Foster

Industrial arts is a study of the changes made by man in the forms of materials to increase their values, and of the problems of life related to these changes.

—Frederick G.
Bonser and Lois
Coffey Mossman

Industrial Arts: Those phases of general education which deal with industry—its organization, materials, occupations, processes, and products—and with the problems of life resulting from the industrial and technological nature of society.

—Gordon O. Wilbur

A further element of general education which is appropriate, not only to the industrial arts teacher, but to all citizens, is that which may be described as the area of important methods and tools of problem solving. Since the scientific method of problem solving is deemed the most valid way that human beings have discovered for solving problems, it becomes obvious that each person should develop...skills in the use of this method.

—Calvin M. Street

It is important that pupils learn to work together. Many (industrial arts) instructors devise projects that require such group action.

—W. Jones

Technology in communication, construction, manufacturing, and transportation will continue to change at a rapid pace... If this is the plan of American industry, technology education teachers must plan to make changes. They must plan to make the curriculum reflect society today.

—Lars Bjorklund

Industrial Arts Education gives an over-all training in industrial adaptability that is most helpful to those who find it necessary to change their type of work from time to time because of the technological developments or changes in the needs of society.

—Louis Newkirk and
William Johnson

Although many educators now call it industrial technology, the art is still there, and we need to keep it there.

—James Howlett and
Brad Huff

He that hath a trade hath an estate; and he that hath a calling hath a place of profit and honor.

—Benjamin Franklin

Children are to study the industries in part 'that they may not be too ignorant of what goes on in the world about them.'...The principles of the mechanic arts should be studied in order that 'any special inclination towards things of this kind may assert itself with greater ease later on.' Moreover, industrial occupations contribute to the maintenance of health...and cultivate the habits of industry and love of work.

—John Comenius
(1592-1670)

Boys would discover their special aptitudes if in addition to academic subjects they were given instruction in the mechanic arts.

—John Comenius
(1592-1670)

A primary purpose of industrial arts education is to interpret to children and youth a dominant aspect of our culture, namely, industry and (2) Mass production—a means of producing goods and services through a unique arrangement of people—is a basic element of modern industry.

—Lloyd H. Wolf and
Wallace Roby

We must accept the basic fact that mathematics and science are of extreme importance in a time when technology plays such an important part. But the fundamental error can be made if there is no opportunity for concrete application of the mathematics and science. This is the point where a truly significant contribution by industrial arts can be made.

—Donald Maley

In its evolution from manual training to its present role of interpreting industry, industrial arts has moved from the simplicity of the frontier craft shop into the complex maze of scientific production. The teacher who approaches the job of explaining this complex without himself understudying the science involved is attempting the impossible.

—Andrew W. Paton

As technology consists of accumulated knowledge, techniques and skills, and their application in creating useful goods and services, the ultimate fruits of a country's technology are found in the standard of living its people are able to enjoy.

—Delmar W. Olson

Industrial arts is more than thing-making. It includes much in addition to tool-using. Though many enjoy using tools to make things, the value of the industrial arts shop is not limited to such enjoyments. The student should be forming, shaping, assembling and experimenting with ideas as well as with hand tools, materials, machines, and projects.

—William J. Micheels

He needed to stay in school only until his 16th birthday. Then he planned to drop out and work in the vineyards with his father. Who needed English, history, and math to pick grapes and prune vines?

He entered the classroom, found an empty seat, and followed along as the other students were asked to get out materials, drawing boards, T-squares, triangles, and scales. Over the next few days he began to learn new things, and he used his hands. He got immediate feedback on his learning, positive comments when what he did was correct, and suggestions on what to do when it was not quite right. He found that he wasn't really conscious of what he was learning; he just did the work.

Gradually he realized this class was interesting. It was hard, but he learned to do the drawings. Soon he began to do them really well. Roberto, for the first time, was learning a skill.

—James Howlett and
Brad Huff

In America where country dwellings are isolated, it is important that the principles of mechanic arts should be widely taught, and that each family should have at least one well-informed member; for a trained mechanic is not always within reach.

—Jacques Charles
Dupont
(1767-1855)

Industrial arts and any hands-on training we can give our students can be as important to them as any English or math class. There is a tremendous amount of research showing how working with one's hands improves one's mental abilities.

—James Howlett and
Brad Huff

Traditional industrial arts 'shop' programs are being revised to focus on the study of technical systems. Many of the new programs are called 'technology education,' and are teaching students what technology is, how it works, and how it affects people's lives. Students are exploring the history of technology as well as recent developments in computers, space technology, robotics, satellite communication, and laser printing.

—David L. McCrory
and E. Allen
Bame

Technology education is: 'A compressive, action-based educational program concerned with technical means, their evolution, utilization, and significance; with industry, its organization, personnel, systems, techniques, resources, and products; and their social/cultural impact.'

—*International
Technology
Education
Association*

Students in...technology education programs are learning about tools, materials, and processes while gaining an appreciation for technology's significant social and cultural aspects. Technology education programs are based on the assumption that because technology affects all people, citizens of tomorrow should understand technology and know how to control it for the betterment of humankind.

—David L. McCrory
and E. Allen
Bame

Technology education programs are designed to help each middle school student to:

- Know and appreciate the importance of technology in the development of humankind.
- Apply tools, materials, processes, and technical concepts safely and efficiently.
- Discover and develop individual talents.
- Apply creative problem-solving techniques.
- Reinforce and apply other school subjects.
- Develop planning skills to deal with the future.
- Adjust to the changing environment.
- Become a wiser consumer.
- Make informed career choices.

—*International
Technology
Education
Association*

Career-Technical Education is organized educational programs offering sequences of courses directly related to preparing individuals for employment in current or emerging occupations requiring other than a baccalaureate or advanced degree. These work force preparation programs include subjects in industrial and technology education, business education, agriculture, medical occupations, etc. They provide a variety of instructional strategies including competency-based applied learning that contributes to an individual's occupation-specific skills, higher-order reasoning, problem solving skills, and academic knowledge necessary for economic independence as a productive and contributing member of society and prepare participants for both post-secondary education and employment. The essential test of whether or not a course of study is Career-Technical Education is found in whether or not the course provides entry-level preparation for a career that is essentially technical in nature, and that does not require a postsecondary or advanced degree.

—*California
Industrial
Technology
Educators
Association*

Some have been exposed to 'shop' or perhaps even the older concepts of 'manual training' or 'manual arts.' The image of building an article or 'project' for the project's sake is giving way to the building of men and women for the world of work.

—Kenneth E. Dawson

There is a general misconception that the useful arts of manufacture are ‘poor relatives’ of science, and that they don’t deserve as much dignity and respect as science itself. Furthermore, in our system of social values, high esteem is accorded to students skilled at expressing themselves verbally and in marshaling arguments, while much less esteem is accorded to those who express themselves through designing and making the visions of their inner eye.

—*Curriculum Review*

TECHNOLOGY—automated machines!

Technology—better living!

Technology—complicated industrial processes!

Technology—reduction of manpower!

Technology—taxing pressures!

Technology—research!

We live in an era often referred to as the technological age. The term technology seems to possess a thousand meanings and its implications are creative, mobile, dynamic, threatening, perplexing, and revolutionary. Technology and industry continuously influence our way of life. We can no longer think of technology as something that is purely mechanical. From the time of man the hunter, the trader, the builder, the manufacturer, the mass producer, up to the time of man the programmer, we can see the various stages of technological development. Today this term is unique

because society has become more aware of the complex integration of men and machines, of ideas, of industrial procedures, of management, and of the necessity to conquer the unknown.

—Kenneth E. Dawson

Industrial arts is that phase of education which offers individuals an insight into our industrial society through laboratory-classroom experiences. Through industrial arts, the role of industry and technology is unfolded as students study the history and development of industrial organizations, materials, products, processes, and related problems. Industrial arts provides experiences that develop basic skills and knowledge common to many occupations and professions. The study of industry helps students understand that the materials and products, which contribute to the comforts of everyday living, are the result of man’s inquiring mind and his ability to solve industrial and technological problems. Actually, industrial arts provides a means by which students can apply in practical and meaningful situations the theoretical principles of science, mathematics, and other related subjects.

—Kenneth E. Dawson

In the early years of the twentieth century, a number of efforts were made to imitate German-style industrial education in the United States. Researchers such as Holmes Beckwith described the relationship between the apprenticeship and continuation school models in Germany, and suggested variants of the system that could be applied in an American context. The industrial education system evolved, after large-scale growth following World War I, into modern vocational education. This CTE (Career Technical Education) Historical Timeline illustrates this evolution:

1. Vocational education was initiated with the passing of the *Smith-Hughes Act* in 1917. This was set up to reduce reliance on foreign trade schools, improve domestic wage earning capacity, reduce unemployment, and protect national security.
2. Around 1947, the *George-Barden Act* expanded federal support of vocational education to support vocations beyond agriculture, trade, home economics and industrial subjects.
3. The *National Defense Education Act*, signed in 1958, focused on improving education in science, mathematics, foreign languages, and other critical areas especially in areas of national defense.
4. In 1963 The *Vocational Education Act* added support for vocational education schools for work-study programs and research.
5. The *Vocational Education Amendments of 1968* modified the Act and created the *National Advisory Council on Vocational Education*.
6. The *Vocational Education Act* was renamed the *Carl D. Perkins Vocational and Technical Education Act* in 1984.
7. Amendments in 1990 created the *Tech-Prep* program designed to coordinate educational activities into a coherent sequence of courses.
8. The Act was renamed the *Carl D. Perkins Career and Technical Education Act* of 2006.

CTE provides opportunities to earn certificates and degrees that teach in-demand skills but provide a fast track to the work force. Unlike the former ‘vocational’ programs, CTE programs and degrees are meant to be academic and stackable—meaning they are credit bearing and individuals can build on to them through continued education. The 30 programs span from culinary arts and hospitality management to fire science, computer science and nursing. But all offerings include a one-year certificate or two-year degree and with a high-skilled hands-on learning experience.

—*Wikipedia*

Vocational education programs have made a real difference in the lives of countless young people nationwide; they build self-confidence and leadership skills by allowing students to utilize their unique gifts and talents.

—Conrad Burns

Since budgets are continuously being cut in favor of the CORE curriculum, shop teachers are required by necessity, to beg, borrow, or steal. Especially beg. It is against California State Education Code to charge students a shop fee for material. However, it's okay to ask for a 'donation.' That's the way most shop teachers get around the law and at least 'keep their monetary head above water.' After that, it's up to the teacher to spend himself into going back to a job that can, at the very least, feed their family. Since this country has proven itself to be crisis-oriented; we industrial arts teachers will have wait until the public's cars are broken down and blocking traffic, there are not enough skilled rough and finish carpenters to keep up with the demand for new houses, IKEA can't supply enough tables for those computers to sit on, and the computers themselves are on the blink with no skilled technician to fix them. But what do I know? I'm just a dinosaur with dirt under my fingernails.

—Steve Green

Man is a Tool-using Animal: Weak in himself, and of small stature, he stands on a basis, at most for the flattest-soled, of some half-square foot, insecurely enough; has to straddle out his legs, lest the very wind supplant him. Feeblest of bipeds!... Nevertheless he can use Tools, can devise Tools: with these the granite mountain melts into light dust before him; he kneads glowing iron, as if it were soft paste; seas are his smooth highway, winds and fire his unwearying steeds. Nowhere do you find him without Tools; without Tools he is nothing, with Tools he is all.

—Thomas Carlyle

It is extremely unlikely that anyone coming out of school with a technical degree will go into one area and stay there. Today's students have to look forward to the excitement of probably having three or four careers.

—Gordon Moore

Johann Pestalozzi (1746-1827) is credited as a force in the Industrial Arts Education movement though he lived in the era of progressive thought. His educational philosophy focused on the most efficient ways to arouse students' ability to problem-solve and process information. With this formed ability to process information young students could comprehend the changing world in which they live. He believed that careful observation and experiencing the senses of seeing, tasting, touching, smelling, and hearing objects and items in the physical world would provide a base for a clear understanding of the development of the nature of objects. The senses would also provide a meaning to the object. Pestalozzi thought that through his process students would naturally learn by themselves.

—Christian R. Misner

A man who works with his hands is a laborer; a man who works with his hands and his brain is a craftsman; but a man who works with his hands and his brain and his heart is an artist.

—Louis Nizer

Technical education is the exaltation of manual labour, the bringing of manual labour up to the highest excellence of which it is susceptible.

—W. E. Gladstone

At the turn of the Twentieth Century, when industry was demanding that workers have the desired knowledge of technology to succeed in the industrial work force, the Douglas Commission in 1906, under Massachusetts Governor William L. Douglas, found a need for the public industrial education of trades. This provided a significant boost for the forces advocating trade training in industrial education. This was an answer to the battle cry of industry. During this time of educational change, John Dewey defended the concept of manual activities as a foundation for educational objectives; he stressed the recognition of a pupil's right to value the nature of their projects. Shortly after Dewey exposed his theory, *Oswego Teachers' College* was on the move in step with the beat of the industrial drum. Oswego took their place in national leadership. This leadership was recognized by the State (of New York) Educational Department in 1911 when a special course for the training of industrial arts teachers was established.

—Christian R. Misner

Some leaders in the field of Manual training, like Charles Richards, felt that the Manual Training Movement needed to change to encompass a wider vision of the educational ideology to align with industry. 'Now that we are beginning to see the scope of this work is nothing short of the elements of the industries fundamental to modern civilization, such a term (manual training) becomes at once a stumbling block and source of weakness.' (1904). In 1904 the Industrial Arts Movement was born. Industrial Arts is useful for everyone. The breadth of the Industrial Arts mission was to allow students an understanding of its extreme complexity. It brings light to the organizations, products, processes, and occupations required in a healthy industry. It is the mission of schools to give every student an appreciation and understanding of our industrial civilization as an essential part of the American way of life, or 'the American dream.'

The American Industrial Arts Association was established in 1939 to help bring to focus the mission of the Industrial Arts movement in schools. In 1966 the *American Council on Industrial Arts Teacher Education* was established.

— Christian R. Misner

The triumph of the industrial arts will advance the cause of civilization more rapidly than its warmest advocates could have hoped, and contribute to the permanent prosperity and strength of the country far more than the most splendid victories of a successful war.

—Charles Babbage

Why aren't America's youth being educated on manufacturing and the rewarding career options related to it? According to Deloitte and the Manufacturing Institute, over the next decade, nearly 3.5 million manufacturing jobs likely will be needed, and 2 million are expected to go unfilled due to the skills gap. About 80% of manufacturers report a moderate or serious shortage of qualified applicants for skilled and highly-skilled production positions....Due to the skills gap and desperately high demand to fill skilled manufacturing positions, there has never been a better time to get into the manufacturing industry. Parents, counselors, high school teachers, and mentors need to open students' eyes to the world of manufacturing and let them know it exists, and that it can provide them with fulfilling, comfortable lives.

—Brandon Blagg (2019)

Concern for man and his fate must always form the chief interest of all technical endeavors. Never forget this in the midst of your diagrams and equations.

—Albert Einstein

As new technologies make old job skills obsolete, the best vocational education will be solid preparation in reading, writing, mathematics, and reasoning. In the future, American workers will acquire many of their job skills in the workplace, not in school. They will need to be able to master new technologies and upgrade their skills to meet specialized job demands. Men and women who have weak basic skills, or who cannot readily master new skills to keep pace with change, may be only marginally employed over their lifetimes.

Business leaders recommend that schools raise academic standards. They point to the need for remedial programs to help low-achieving students and to reduce dropping out.

Business leaders stress that the school curriculum should emphasize literacy, mathematics, and problem-solving skills. They believe schools should emphasize such personal qualities as self-discipline, reliability, perseverance, teamwork, accepting responsibility, and respect for the rights of others. These characteristics will serve all secondary students well, whether they go on to college or directly into the world of work.

—*U.S. Department of
Education—What
Works*

WOODWORKING/CARPENTRY

Woodworking is a most satisfying pastime, so varied and multifaceted you will never complete the twin processes you have undertaken: acquiring tools and learning how to use them. You have begun a lifetime pursuit.

—Michael Dunbar

The feel and beauty of finely crafted wood...the refreshing smell of your workshop... the absorbing joy of cutting and joining that makes the hours race by... These are the reasons you love woodworking.

—Jack Nee

Woodworking matters. It's more than a pastime or hobby—being a woodworker means that you know the satisfaction and pride that comes from using your hands and mind to build beautiful, functional objects, and that you're as interested in the process as the outcome. Amid the speed and chaos of the modern world, woodworking gives us a place where we can slow down, pay attention, and take the time to do things right.

—Aimé Ontario Fraser

If you want to drive in a nail without smashing your fingers, hold the hammer in both hands.

--Unknown

Keep your fingers away from a power saw—it doesn't know you need them.

--Unknown

Regard it as just as desirable to build a chicken house as to build a cathedral. The size of the project means little in art, beyond the money matter. It is the quality of character that really counts. Character may be large in the little or little in the large.

--Frank Lloyd Wright

To build!
That is the noblest of all the arts.

—Henry Wadsworth
Longfellow

When we build, let us think that we build for ever.

--John Ruskin

Any jackass can kick down a barn, but it takes a good carpenter to build one.

--Sam Rayburn

Where you find quality, you will find a craftsman, not a quality-control expert.

—Robert Brault

Even in beginning woodshop, students like to build something that looks good and that is made of something other than pine, birch, or wood salvaged from discarded shipping pallets.

Now we get into the area of cost/benefit analysis. At \$5 a board foot for some of the more common woods used, it might be a good idea to be able to calculate the number of board feet to be used in a proposed project and then get a cost estimate before you plow ahead with your plans to make a stereo cabinet out of solid Brazilian walnut.

—James Howlett and
Brad Huff

Woodshop students also have to learn about different woods and how grain affects the fit and potential warping of a board. What is grain? How do we look at wood and find a piece that will do what we want it to do without splitting a year after the project is finished? In many quarters this is called materials science.

—James Howlett and
Brad Huff

What in the world is meant by 'board feet' anyway? Well, a piece of wood that is 1 foot square and 1 inch thick, makes up a board foot. Oh yes, and if your wood is called 1 inch thick, it is really $\frac{3}{4}$ of an inch thick. So here we are back to measuring and calculating using fractional inches, having to think about how long the shelf will be if we want a bookcase that's 4 feet long and the inside shelves are to fit into a dado cut that is $\frac{3}{8}$ inch deep. And while we are thinking of a dado cut, how many shims are required to set the blade to make a $\frac{3}{4}$ -inch dado? Measuring and calculating are happening all the time.

—James Howlett and
Brad Huff

Each plank...can have only one ideal use. The woodworker must find this ideal use and create an object of utility to man, and if nature smiles, an object of lasting beauty.

—George Nakashima

If we include house construction under a broad category of woodworking or construction, then we have a whole host of additional mathematical problems: studs on 16-inch centers and stub wall stud lengths for windows that have to be placed according to the local building code.

How many steps will you put in and what rise and run will you use to match the building specs for that staircase to the second floor on the custom-built house that has 12-foot ceilings on the first floor? What will be the angle of cut on the roof stringers so they match at the peak, what should the roof pitch be, and how do we calculate that?

—James Howlett and
Brad Huff

Law of the Workshop: Any tool, when dropped, will roll to the least accessible corner.

—Unknown

The Legislature have appropriated \$6,000 to defray the funeral expenses of the Princess. The obsequies will take place the latter part of next week. I have seen the coffin (it is not quite finished yet), and certainly it is the most elegant piece of burial furniture I ever saw. It is made of those two superb species of native wood, kou and koa. The former is nearly as dark as ebony; the latter is like fine California laurel, richly grained and clouded with mahogany. Both woods have an iron-like hardness, and are exceedingly close in grain, and when highly polished and varnished nothing in the shape of wood can be more brilliant, more lustrous, more beautiful. It produces a sort of ecstasy in me to look at it, and holds me like a mesmeric fascination. There is nothing extraordinary about the fashioning—the planning and construction—of this coffin, but still it is beautiful. The wood is so splendidly burnished, and so gracefully grained and clouded.

—Mark Twain

A bad day woodworking is better than a good day working.

—Unknown

Woodworking minus patience equals firewood.

—Unknown

Woodworking gives me something useful to do when I'm feeling puny and it takes my mind off my troubles.

—Gary McCarthy

When I'm working on a problem, I never think about beauty. I think only how to solve the problem. But when I have finished, if the solution is not beautiful, I know it is wrong.

—R. Buckminster Fuller

Skill without imagination is craftsmanship and gives us many useful objects such as wickerwork picnic baskets. Imagination without skill gives us modern art.

—Tom Stoppard

The pioneers cleared the forests from Jamestown to the Mississippi with fewer tools than are stored in the modern garage.

—Unknown

Only those who have the patience to do simple things perfectly ever acquire the skill to do difficult things easily.

—Friedrich von Schiller

The carpenter is not the best who makes more chips than all the rest.

—Arthur Guiterman

The finest tool ever created is the human hand, but it is weak and it is fallible.

—Cecil Pierce

Give me six hours to chop down a tree and I will spend the first four sharpening the ax.

—Abraham Lincoln

Everything with a power cord eventually winds up in the trash.

—John Sarge

Hand-craft signifies cunning, or sleight, or Craft of the Hand, which cannot be taught by Words, but is only gained by Practice and Exercise.

—Joseph Moxon

A simple bench is like Tuscan pasta soup. You think it will be better if you add more stuff. But getting the basics right is way more important, and the extras won't make up for a poorly prepared stock.

—Adam Cherubini

The things I make may be for others, but how I make them is for me.

—Tony Konovaloff

Ease and speed in doing a thing do not give the work lasting solidity of exactness of beauty.

—Plutarch

Why should a craftsman not make use of all his tools if they will promote a greater communication and expressiveness? This is not to deny that beautiful things can be fashioned out of very modest means, but what possible objection can there be towards an artist trying to be more resourceful?

—Don Ellis

Anybody can become a woodworker, but only a Craftsman can hide his mistakes!

—Walter Blodget

The only really good place to buy lumber is at a store where the lumber has already been cut and attached together in the form of furniture, finished, and put inside boxes.

—Dave Barry

If man has good corn, or wood, or boards, or pigs to sell, or can make better chairs or knives, crucibles, or church organs, than anybody else, you will find a broad, hard-beaten road to his house, though it be in the woods.

—Ralph Waldo
Emerson

Woodworking requires a completely different kind of thinking and problem-solving ability than writing. With writing, you take a set of facts and ideas, and you reason your way forward to a story that pulls them together. With woodworking, you start with an end product in mind, and reason your way backward to the raw wood.

—Joshua Foer

Arguments with furniture are rarely productive.

—Kehlog Albran

With woodworking, it's really sort of gratifying to be able to have an actual piece to touch, and then step back and be able to share it.

—Luke Kirby

Measure twice. Cut once. Curse. Buy more. Cut again.

—Unknown

On a small square, wood is being cut for the city school. Cords of healthy, crisp timber are piled high and melt slowly, one log after another, under the saws and axes of workmen. Ah, timber, trustworthy, honest, true matter of reality, bright and completely decent, the embodiment of the decency and prose of life! However deep you look into its core, you cannot find anything that is not apparent on its evenly smiling surface, shining with that warm, assured glow of its fibrous pulp woven in a likeness of the human body. In each fresh section of a cut log a new face of the human body. In each fresh section of a cut log a new face appears, always smiling and golden. Oh, the strange complexion of timber, warm without exaltation, completely sound, fragrant, and pleasant!

—Bruno Schulz

I loved sitting on the pile of freshly cut logs, running my hands over the different shapes and smelling their woody fragrance. To this day I think that there is nothing as interesting to look at as a heap of newly cut logs, the delicate colouring of their veined insides telling their life story, while they wait to bring warmth and comfort.

—Alice Taylor

Wood, if you stop to think of it, has been man's best friend in the world. It held him in his cradle, went to war as the gunstock in his hand, was the frame of the bed he came to rejoicing, the log upon his hearth when he was cold, and will make him his last long home. It was the murmuring bough above his childhood play, and the roof over the first house he called his own. It is the page he is reading at this moment; it is the forest where he seeks sanctuary from a stony world.

—Donald Culross
Peattie

A bad workman always blames his tools.

--Proverb

Real men measure once, cut once. Then they head back to the lumberyard.

—Unknown

I work to support my woodworking habit.

—Unknown

When you're a carpenter making a beautiful chest of drawers, you're not going to use a piece of plywood on the back, even though it faces the wall and nobody will ever see it. You'll know it's there, so you're going to use a beautiful piece of wood on the back.

—Steve Jobs

Isn't it strange how princes and kings,
and clowns that caper in sawdust rings,
and common people, like you and me,
are builders for eternity?
Each is given a list of rules;
a shapeless mass; a bag of tools.
And each must fashion, ere life is flown,
A stumbling block, or a Stepping-Stone.

—Unknown

For a craftsman like my father, nothing is more exasperating than to witness tool abuse. In particular, I remember a steel tape measure he gave me after I had somehow managed to lose the first twelve inches of it.

—Richard Menzies

I think objects made of wood by children, left to their own devices, if such there be, will assay ten percent wood, ninety percent nails.

—Robert Paul Smith

The best carpenters make the fewest chips.

—English Proverb

Every nail driven should be as another rivet in the machine of the universe.

—Henry David
Thoreau

There is some of the same fitness in a man's building his own house that there is in a bird's building its own nest. Who knows but if men constructed their dwellings with their own hands, and provided food for themselves and families simply and honestly enough, the poetic faculty would be universally developed, as birds universally sing when they are so engaged? But alas! we do like cowbirds and cuckoos, which lay their eggs in nests which other birds have built, and cheer no traveller with their chattering and unmusical notes. Shall we forever resign the pleasure of construction to the carpenter?

—Henry David
Thoreau

It is the accuracy and detail inherent in crafted goods that endows them with lasting value. It is the time and attention paid by the carpenter, the seamstress and the tailor that makes this detail possible.

—Tim Jackson

I spend a lot of time doing carpentry. Sometimes there is nothing that gives me the contentment that sawing a piece of wood does.

—Abbas Kiarostami

It's amazing how many houses are built with the logistical impossibility of bringing a sofa in.

—Paul Hymers

One was a 17th-century cottage complete with low ceilings, cut down doorways that you had to stoop to pass through...—there have been cases where people have died after clocking their heads so frequently in old cottages—and I was told it was part of the character.

—Paul Hymers

Are the tools without, which the carpenter puts forth his hands to, or are they and all the carpentry within himself; and would he not smile at the notion that chest or house is more than he?

—Cyrus A. Bartol

The house-builder at work in cities or anywhere,
The preparatory jointing, squaring, sawing, mortising,
The hoist-up of beams, the push of them in their places, laying them regular,
Setting the studs by their tenons in the mortises, according as they were prepared,
The blows of the mallets and hammers.

—Walt Whitman

The carpenter dresses his plank—the tongue of his fore-plane whistles its wild ascending lisp.

—Walt Whitman

The carpenter stretches out a line. He marks it out with a pencil. He shapes it with planes. He marks it out with compasses, and shapes it by the figure of a man, with the beauty of a man, to reside in a house.

—*Isiah: 44*

FUNNY CONSTRUCTION SLOGANS/SAYINGS

Roof with the best, or leak like the rest.

We nail it!

If your house is anything like mine – it needs fixing.

I love the smell of sawdust in the morning.

We ♥ scaffold.

Call us or... Screw it up yourself.

Teams on beams.

CREATIVE YET PROFESSIONAL CONSTRUCTION SLOGANS

Doing it right costs less than than doing it over!

Your project is our business.

Building relationships one house at a time.

Not all contractors are created equal.

From the ground up!

Don't just build... Create!

Love where you live... Renovate.

—<http://blog.customink.com/2012/12/construction-slogans/>

WORKSHOP TEN COMMANDMENTS

1. I am the lord and master here, let no strangers enter.
2. Thou shalt not take my name in vain if I refuse to do a job.
3. Remember—I don't work Sundays.
4. Honor my tantrums.

5. Thou shalt not borrow my tools.
6. Thou shalt not touch my tools.
7. Thou shalt not commit alterations of my work.
8. Thou shalt not bear false criticisms of my work.
9. Thou shalt not covet my workshop.
10. Thou shalt not covet my workshop tools.

—Unknown

I tried to come up with a carpentry pun that woodwork. I think I nailed it but nobody saw it.

—Internet Meme

Just found out the company that produces yardsticks won't be making them any longer.

—Internet Meme

WELDING

Welder: My craft allows me to build anything in the world. I possess a skill set 98% of the population can't do. I'm the last of a dying breed of people who aren't afraid to get their hands dirty. Greatest craft in the world.

—Welding Poster

Even with the procession of headlights on the slow moving highway, the wintry sky is dark. Then twenty feet up to the left on a steel girder, a support for the new sky-train system, comes flashes like a firework. Only these golden yellow sparks originate from a fixed in position, and fly outwards into the night, a fiery flower. Their intense bursts illuminate the face shield of the welder, who is no doubt working overtime tonight. The joint fused will bear the weight of thousands of passenger trains and bring new residents and commerce to the area. It will help bring the mass transit we all need. Yet these sparks that fly tonight are forgotten as soon as they fade to black.

—Unknown

You can have self-taught ‘shade tree welders’ in any garage, but it takes a welding artist to do the job correctly.

—James Howlett and
Brad Huff

It has taken a great deal of energy, which has not been so difficult to summon as the necessary patience to wait, simply wait much of the time - until my instincts assured me that I had assembled my materials in proper order for a final welding into their natural form.

—Hart Crane

My childhood was really nice. My parents never forced me to do anything; it was always, ‘If you want to do that, fine.’ When I told my father I was going to be an actor, he said, ‘Fine, but study welding just in case.’

—Robin Williams

I think it’s a real shame so many schools have taken out the hands-on classes. Art, music, auto mechanics, cooking, sewing, these are all things that can turn into jobs. You know, wood shop, steel shop, welding. These are all things that can turn into great careers, get kids interested. How can you get interested in these careers if you don’t try them on a little bit?

—Temple Grandin

I worked in a steel mill, I worked in a foundry, I worked in a paper mill, I worked in a chemical refinery, construction, I did all that. It was great work, it was good. I learned welding, mechanic, carpentry, but it saved me from going back to prison because that’s helpful.

—Luis J. Rodriguez

Pipeline welders—we do more before 9 a.m. than most people do all day.

—Unknown

YOU MIGHT BE A WELDER IF...

Your arms look like those of a heroin addict from weld spatter.

You ever heard the sizzle of hot slag in ur ear.

You still wear long sleeve shirts, even when it’s 104 outside.

All your shirts have a bunch of little hole in them.

People are jealous of your tan caused by welding without PPE.

You walk around and judge every single weld.

You find yourself addicted to the burning metal smell.
You catch yourself on fire and love it.

—Unknown

YOU MIGHT BE A WELDER IF...

...everyone is asking you, ‘Couldn’t you just buy that?’
...you use a welding rod for chop sticks.
...you have sunburn in the winter.
...your shirts, sneakers, and socks are ventilated.
...you find yourself flicking your head down when the sun gets in your eyes.
...you keep feeling for a knob on the back of your hard hat or baseball cap.
...you squeeze your fork to release the food.
...your friends say, ‘It’s Miller time!’ and you grab your gloves and shield.
...you lay z-weave ketchup beads on your eggs or french fries.
...you tie things down with MIG wire.
...you own a triple barrel shotgun.

—Unknown

YOU MIGHT BE A WELDER IF...

The smell of burnt steel turns you on.
The smell of cutting oil also turns you on.
You use a welder for things other people wouldn’t think of, (like using a mig welder to remove a race {the outer half of bearings} from a wheel hub.
You own 8 pairs of welding gloves, and still burn your hands once/week because you aren’t wearing ANY of them.
Lincoln is a tool, not a president.
You know EXACTLY what happens when a glowing hot bit of slag falls onto your foot, when you are wearing running shoes.
You’ve ever discharged mucous from your nose that can be picked up with a magnet (cutting/grinding without a mask).

—Unknown

It’s called the ‘Trail of Tears’ when a red hot sizzler makes it into your collar and works it’s way down toward your beltline and beyond... while you’re making desperate grabs trying to slow the sucker’s progress. I’ve accumulated quite a few little scars over the years...and I believe a few have even made it to my boots.

—Unknown

You want to know why we have lawyers, doctors, and pipe fitters? Because they can’t weld.

—Unknown

You know you're a welder when you understand just how much time you have to finish a weld before our smoldering clothes become a problem.

—Unknown

Nothing like the smell of burning flux in the morning.

—Unknown

Ever put ear plugs in your nose and ears to keep out the sparks while in an upside down position?

—Unknown

There are welders, and there are dobbers. A welder knows about theory, metallurgy, and hands-on skill. A dobber shows up at work and slops down beads, without a clue as to how they are affecting the steel.

—Unknown

ELECTRICAL WORK/ELECTRONICS

How about the effect of magnetic lines of flux and magnetic fields on a copper wire? Lawn mowers do not require a battery-operated ignition system; they use magnetos. The ignition points have to be set to within the correct gap measured in thousandths of an inch, or the ignition system will not operate correctly. We teach compression ratios, and students have to calculate engine displacements, which involves volumetric measurements of cylinders. Finding the volumes of cylinders is taught in first-year algebra, but algebra doesn't include finding compression ratios.

—James Howlett and
Brad Huff

It really should be a criminal offense for an electrician to mount a breaker box on a bedroom wall. Unfortunately, I see the solar industry mounting inverters on bedroom walls.

—Steven Magee

Industrial arts students need to learn air-to-fuel ratios so that proper combustion is achieved, why a capacitor is needed across the points, why there is a gap in the laminations of a magneto coil to ensure proper changes in magnetic flux, and what ratio of turns in a magneto coil is needed to achieve a 10,000-volt spark to jump

across the .035-inch gap of a spark plug. Why do we need 10,000 volts in an engine when we can get a spark of 1,000 volts to jump an inch in dry air? What does compression have to do with voltage requirements?

—James Howlett and
Brad Huff

The difference between electricity and electronics is the difference between a toaster and a television set.

—Isaac Asimov

Electricity is really just organized lightning.

—George Carlin

Time and task were both disorienting, for if you were to remove everything from our lives that depends on electricity to function, homes and offices would become no more than the chambers and passages of limestone caves- simple shelter from wind and rain, far less useful than the first homes at Plymouth Plantation or a wigwam. No way to keep out cold, or heat, for long. No way to preserve food, or to cook it. The things that define us, quiet as rock outcrops - the dumb screens and dials, the senseless clicks of on/off switches- without their purpose, they lose the measure of their beauty and we are left alone in the dark with countless useless things.

—Jane Brox

I knew a kid who stuck a knife in the toaster on a few occasions. He learned it hurt. He grew up to be a great electrician.

—Travis J. Dahnke

You should be aiming to illuminate your indoor daytime environment with natural outdoor light, not electrical lighting products.

—Steven Magee

During my pre-college years I went on many trips with my father into the oil fields to visit their operations. ... I puttered around the machine, electronics, and automobile shops while he carried on his business. Both of my parents are inveterate do-it-yourselfers, almost no task being beneath their dignity or beyond their ingenuity. Having picked up a keen interest in electronics from my father, I used to fix radios and later television sets for fun and spending money. I built my own hi-fi set and enjoyed helping friends with their amateur radio transmitters, but lost interest as soon as they worked.

—Robert Woodrow
Wilson

POWER MECHANICS

The best-known manufacturer of small engines, Briggs and Stratton, produces 12 million engines each year and has about 60,000 dealers nationwide, each with a trained technician. From where do those technicians come?

—James Howlett and
Brad Huff

My mother's dad dropped out of the eighth grade to work. He had to. By the time he was 30, he was a master electrician, plumber, carpenter, mason, mechanic. That guy was, to me, a magician. Anything that was broken, he could fix. Anybody anywhere in our community knew that if there was a problem, Carl was there to fix it.

—Mike Rowe

Now, what about something like 'Outdoor Power Mechanics?' That's educationese for learning how to repair lawn mower engines. How many of us remember Bernoulli's principle from science class? That is what makes carburetors work. Industrial arts students have to know this. When they see it on a test, they will already have seen it work and know what it is.

—James Howlett and
Brad Huff

Students must learn to think in decimals. In the commercial machine shop, '125' is immediately understood to be $\frac{125}{1000}$ of an inch. We have to teach our students to read vernier and micrometer scales so that they can accurately measure to $\frac{1}{1000}$ of an inch. This is because we expect our students to be able to machine a part to this tight a tolerance, about a quarter of the thickness of a human hair.

—James Howlett and
Brad Huff

When we start to teach machine tool cutting speeds and feed rates, we have to be concerned about rotating diameters and the surface speed of the material being worked by the tool bit. On a lathe, how does the surface speed change as the diameter of the material we are working on decreases?

For a milling machine, students need to know the rotational speed of the bit, its diameter, and how many cutters it has. All that information must be used to calculate the proper feed rate of the material past the cutter. Show me a math class that teaches that or that motivates, a student to learn the math he or she must know to machine a part to the required tolerances.

—James Howlett and
Brad Huff

Safety—there's no future without it.

--Unknown

I was a mechanic in the Navy. And mechanics in the Navy are like mechanics in airlines. You may have more stripes than I do, but you don't know how to fix the airplane.

—Gordon Bethune

We also have to include instruction on different metals and what the characteristics of each are for machining. We don't expect our students, or anyone else for that matter, to remember all the information necessary for a machinist to do a competent job. That information is found in the *Machinists Handbook*, which has been in print for more than a hundred years, is updated annually, and is now a tome of more than 4,000 pages in several volumes. Yes, we expect our students to be able to access that book, find the section they need, read it with understanding, and use what they have read.

Machinists must be as facile with angular measurement as are draftsmen. In cutting threads on a nut or bolt, the standard V thread that we are all familiar with (because that is what we see used on the nuts and bolts in our local hardware store; uses a 60-degree V that is split along the centerline of the V. We have to grind a tool bit that is in that shape and then cut the threads, making repeated measurements to ensure the proper depth as measured from the crest to the root of the thread. Inside threads are another interesting challenge. Threads are an example of artistry in machining. Well-cut threads are beautiful to behold!

—James Howlett and
Brad Huff

That's all the motorcycle is, a system of concepts worked out in steel. There's no part in it, no shape in it, that is not out of someone's mind [...] I've noticed that people who have never worked with steel have trouble seeing this—that the motorcycle is primarily a mental phenomenon. They associate metal with given shapes—pipes, rods, girders, tools, parts—all of them fixed and inviolable., and think of it as primarily physical. But a person who does machining or foundry work or forger work or welding sees 'steel' as having no shape at all. Steel can be any shape you want if you are skilled enough, and any shape but the one you want if you are not. Shapes, like this tappet, are what you arrive at, what you give to the steel. Steel has no more shape than this old pile of dirt on the engine here. These shapes are all of someone's mind. That's important to see. The steel? Hell, even the steel is out of someone's mind. There's no steel in nature. Anyone from the Bronze Age could have told you that. All nature has is a potential for steel. There's nothing else there.

—Robert M. Pirsig

You have to look for teachers. If you want to be a mechanic, go hang out with mechanics.

—Robert Kiyosaki

The planter, the farmer, the mechanic, and the laborer... form the great body of the people of the United States, they are the bone and sinew of the countrymen who love liberty and desire nothing but equal rights and equal laws.

—Andrew Jackson

I have rarely seen the face of a mechanic in the action of creation which was not fine, never one which was not earnest and impressive.

—Thomas Nelson Page

In America, the professor talks to the mechanic. They are in the same category.

—Noam Chomsky

I come from a blue collar family, but my personal life isn't. I didn't get the gene that my grandfather had in spades. He was a local hero. Built the church that I went to. Built the house I grew up in. Steamfitter, pipefitter, electrician, mechanic and plumber. I wanted to do those things. But it just didn't come easy.

—Mike Rowe

Go into the auto mechanic; you've got to know computers to be able to work on the cars.

—Ann McLane Kuster

You can reduce your anxiety somewhat by facing the fact that there isn't a mechanic alive who doesn't louse up a job once in a while. The main difference between you and the commercial mechanics is that when they do it you don't hear about it—just pay for it, in additional costs prorated through all your bills. When you make the mistakes yourself, you at least get the benefit of some education.

—Robert M. Pirsig

Not everyone understands what a completely rational process this is, this maintenance of a motorcycle. They think it's some kind of 'knack' or some kind of 'affinity for machines' in operation. They are right, but the knack is almost purely a process of reason, and most of the troubles are caused by what old time radio men called a 'short between the earphones,' failures to use the head properly. A motorcycle functions entirely in accordance with the laws of reason, and a study of the art of motorcycle maintenance is really a miniature study of the art of rationality itself.

—Robert M. Pirsig

Whenever someone like a plumber or a mechanic tries to explain something technical to me, I listen for about three seconds before it all just becomes white noise, like Charlie Brown's teacher.

—John Niven

Motorcycle maintenance gets frustrating. Angering. Infuriating. That's what makes it interesting.

—Robert M. Pirsig

On any mechanical repair job ego comes in for rough treatment. You're always being fooled, you're always making mistakes, and a mechanic who has a big ego to defend is at a terrific disadvantage. If you know enough mechanics to think of them as a group, and your observations coincide with mine, I think you'll agree that mechanics tend to be rather modest and quiet. There are exceptions, but generally if they're not quiet and modest at first, the work seems to make them that way. And skeptical. Attentive, but skeptical. But not egotistic. There's no way to bullshit your way into looking good on a mechanical repair job, except with someone who doesn't know what you're doing.

—Robert M. Pirsig

Finally, if you're as exasperated as I am by the parts problem and have some money to invest, you can take up the really fascinating hobby of machining your own parts. [...] With the welding equipment you can build up worn surfaces with better than original metal and then machine it back to tolerance with carbide tools. [...] If you can't do the job directly you can always make something that will do it. The work of machining a part is very slow, and some parts, such as ball bearings, you're never going to machine, but you'd be amazed at how you can modify parts designs so that you can make them with your equipment, and the work isn't nearly as slow or frustrating as a wait for some smirking parts man to send away to the factory. And the work is gumption building, not gumption destroying. To run a cycle with parts in it you've made yourself gives you a special feeling you can't possibly get from strictly store-bought parts.

—Robert M. Pirsig

Africa will get nowhere until we have mechanics... Mechanics are the first stone in the building. Then there are other people on top. Doctors. Nurses. Teachers. But the whole thing is built on mechanics. That is why it is important to teach young people to be mechanics.

—Alexander McCall
Smith

There's a school of mechanical thought which says I shouldn't be getting into a complex assembly I don't know anything about. I should have training or leave the job to a specialist. That's a self-serving school of mechanical elitence I'd like to see wiped out. [...] You're at a disadvantage the first time around it may cost you a little more because of parts you accidentally damage, and it will almost undoubtedly take a lot more time, but the next time around you're way ahead of the specialist. You, with gumption, have learned the assembly the hard way and you've a whole set of good feelings about it that he's unlikely to have.

—Robert M. Pirsig

The machine itself receives some of the same feelings. With over 27,000 on it it's getting to be something of a high-miler, and old-timer, although there are plenty of older ones running. But over the miles, and I think most cyclists will agree with this, you pick up certain feelings about an individual machine that are unique for that one individual machine and no other. A friend who owns a cycle of the same make, model and even same year brought it over for a repair, and when I test rode it afterward it was hard to believe it had come from the same factory years ago. You could see that long ago it had settled into its own kind of feel and ride and sound, completely different from mine. No worse, but different.

I suppose you could call that a personality. Each machine has its own, unique personality which probably could be defined as the intuitive sum total of everything you know and feel about it. This personality constantly changes, usually for the worse, but sometimes surprisingly for the better, and it is the personality that is the real object of motorcycle maintenance. The new ones start out as good-looking strangers, and depending on how they are treated, degenerate rapidly into bad-acting grouches or even cripples, or else turn into healthy, good-natured, long-lasting friends.

—Robert M. Pirsig

Don't trust children with edge tools. Don't trust man, great God, with more power than he has until he has learned to use that a little better.

—Ralph Waldo
Emerson

My uncle is a mechanic, and I wish I had paid more attention, but I never did.

—Lucas Till

No tricks, no tools, but talent makes a task truly top class.

—Amit Kalantri

Let's create positive change on this planet; With either: the hyper sophisticated tools we have, or the mobile device we are.

—Natasha Tsakos

The inventors of tools enhance civilization,
but the author of ideas enables them to invent.

—Toba Beta

There is no easy way to train an apprentice. My two tools are example and nagging.

—Lemony Snicket

When human men hold an object that makes a powerful noise, or has moving parts, or spins around fast, or has a button they can push (which either screws or nails something) they become Gods in their own heads.

They can do anything: they can eat through walls and bring buildings together to form mighty empires.

They can build floating cities and flying tin cans.

But they still can't make their own beds.

—Craig Stone

AUTOMOTIVE REPAIR

Aerodynamics are for people who can't build engines.

—Enzo Ferrari

Never trust a mechanic who drives new cars. They're either charging too much money for their work, or they can't keep an old car running—maybe both.

—Patricia Briggs

Horsepower is how fast you hit the wall. Torque is how far you take the wall with you.

—Unknown

THE OLD TRUCK IN THE MASTER'S HAND

The old truck hadn't been used in a while,
But it should be good for a few more miles.

Under the hood, the engine was rusty,
And the interior smelled faintly musty.

Assuming it would start—we all wanted to know...

When we put it in gear, would it actually go?

Someone called, 'All the tires are flat.'
But a little new air would take care of that.
Better get some fuel, since the gauge is on 'E.'
Wash the windshield, so the driver can see.
No problem to let it coast downhill to the mechanic's shop;
Next question: Are the brakes good enough to make it stop?
The truck was so bad, it had no heater fan.
But the Master Mechanic had a Master plan!
He took it to His shop for the needed repairs.
'Twas quite a long time that He kept it there.
He tinkered, and cut, and removed lots of stuff
Solving problems we had thought were real tough.
He put in new hoses, gaskets, and such.
What a joy to watch His skillful touch,
As He cut away the old to make room for the new.
Finally the day arrived when he was all through.
A great crowd gathered around the shop door,
To behold the new creation, there on the floor!
It was washed up, and pumped up, and all the fluids were filled.
Even the body He had been forced to rebuild.
Fresh paint; new tires; and the engine a'humming.
It was ready to face the world oncoming!
When flaws seem difficult to be fixed by man.
Stand back, and watch the touch of the Master's Hand.

—Charlie Pelota

With each replacement of parts, a car slowly becomes Chinese.

—Mr. Kuniyasu

Mechanic: Someone who does precision guesswork based on unreliable data provided by those of questionable knowledge. See also WIZARD, MAGICIAN.

—Unknown

If she's holding a wrench, either marry her or run.

—T-Shirt Slogan

Oh, right here is your problem...your radiator cap is attached to a piece of crap.

—Unknown

Two liters is a soft drink not an engine size.

—Unknown

I'm a mechanic because your honor roll student that got an engineering degree can't design it right the first time.

—Unknown

Take care of your car in the garage, and the car will take care of you on the road.

—Amit Kalantri

Hey, don't knock it. It still runs. Most of the time, even after I turn it off.

—Sherrilyn Kenyon

THE AUTOMOBILE MECHANIC

The automobile mechanic was originally
a car owner who carried out his own repairs
during the turn of the 19th Century.
These days, it is a person who endeavours to fix
the car problems of the everyday motorist
he is part engineer, detective, and miracle worker
all rolled into one, when the motorist expects their car
virtually fixed at a moment's notice.
He is truly a modern day unsung hero to most
who keep their car in tip top condition
although the mechanic seldom gets
the credit that he or she rightly deserves.

—John Ginesi

You might be a mechanic if...
Your toolbox costs more than your car.
You wash your hands before using the bathroom.
All your clothes have grease/oil stains.
You are too lazy to fix your own car.

...

The tool truck guys know you by name.
You use brake clean and find a cut you didn't know about.

—Unknown

At a car dealership, the person who sells the car is the hero, and also gets the commission. But if the mechanics don't service that car well, the customer won't return.

—Roger Staubach

ROBOTICS

We need to have making, including computer science, shop, etc. as part of the core curriculum from the beginning, not just an optional afterschool thing. Things like First Robotics and all of those great programs need to become mainstream.

—Megan Smith

If you look at the field of robotics today, you can say robots have been in the deepest oceans, they've been to Mars, you know? They've been all these places, but they're just now starting to come into your living room. Your living room is the final frontier for robots.

—Cynthia Breazeal

In the fifties, it was predicted that in 5 years robots would be everywhere.
In the sixties, it was predicted that in 10 years robots would be everywhere.
In the seventies, it was predicted that in 20 years robots would be everywhere.
In the eighties, it was predicted that in 40 years robots would be everywhere...

—Marvin Minsky

Got a 2.4 GPA my first semester in college. Thought maybe I wasn't cut out for engineering. Today I've landed two spacecraft on Mars, and designing one for the moon. STEM is hard for everyone. Grades ultimately aren't what matters. Curiosity and persistence matter.

—Ben Cichy

Many preeminent researchers of technological change and labor markets do not share [Andrew] Yang's vision of a robot-driven jobs apocalypse. They argue that in the past, machines have not taken away work so much as freed up humans to do safer, less drudging, more creative work.

—Annie Lowrey

DRAFTING/GRAPHIC ARTS

Industrial arts courses support the academic core subjects of math and reading. First, every industrial arts class requires measuring. While a multiple-choice test can't assess a student's ability to machine a part to within a thousandth of an inch

or to program a computer numerical machine, it can assess a mastery of knowing how to measure. In addition, students have to know what to do with those measurements, how to manipulate them, and how to add, subtract, multiply, and divide fractions and decimals, all of which are testable. But that is the simple stuff. Students in a drafting course must master the concepts of perpendicular, radius and diameter, tangential relationships between circles and straight lines, and angular measurements and must develop the ability to read and measure using architectural, mechanical, and metric scales.

—James Howlett and
Brad Huff

An architect's most useful tools are an eraser at the drafting board, and a wrecking bar at the site.

—Frank Lloyd Wright

What I learned from architectural drafting is that everything has to have a plan to work. You just can't wing it. I can't get all the materials I need for a house and just start building...you have to plan it out.

—Ice Cube

Because the U.S. has yet to adopt the metric system for measurement, much of the work students do is in fractional parts of an inch. Then the students must convert fractions to decimals because machinists work in decimals. The students become fluent in the language of drafting and adept in the use of drafting tools because they have to finish project drawings. And they have to be able to mentally 'picture' what they draw in three-dimensional space without the aid of a computer. Also in drafting, students have to apply the Pythagorean theorem and solve quadratic equations to find the radius of an arc, which are practical applications of some fairly complex thinking.

—James Howlett and
Brad Huff

I believe in the hand-brain, pencil-to-paper-brain connection. In fact, I teach and I have the first year students do all of their drafting by hand to remind them that there is this physical connection between the two.

—Jennifer Tipton

The level of detail and craft is something that's inscribed within the original design concept. And so when I begin to draw, I know what kind of detailing I want the building to have.

—Tadao Ando

Digital design is like painting, except the paint never dries.

—Neville Brody

God created paper for the purpose of drawing architecture on it. Everything else is, at least for me, an abuse of paper.

—Alvar Aalto

The public is more familiar with bad design than good design. It is, in effect, conditioned to prefer bad design, because that is what it lives with. The new becomes threatening, the old reassuring.

—Paul Rand

You can have an art experience in front of a Rembrandt... or in front of a piece of graphic design.

—Stefan Sagmeister

It's through mistakes that you actually can grow. You have to get bad in order to get good.

—Paula Scher

A designer knows he has achieved perfection not when there is nothing left to add, but when there is nothing left to take away.

—Antoine de
Saint-Exupéry

The more I deal with the work as something that is my own, as something that is personal, the more successful it is.

—Marian Bantjes

I strive for two things in design: simplicity and clarity. Great design is born of those two things.

—Lindon Leader

The life of a designer is a life of fight. Fight against the ugliness. Just like a doctor fights against disease. For us, the visual disease is what we have around, and what we try to do is cure it somehow with design.

—Massimo Vignelli

Everything is designed. Few things are designed well.

—Brian Reed

Design is not just what it looks like and feels like. Design is how it works.
—Steve Jobs

Design is intelligence made visible.
—Alina Wheeler

Nail the basics first. Detail the details later.
—Chris Anderson

When you are stuck, walk away from the computer and draw. It will teach you how to see.
—Gerard Huerta

Design is thinking made visual.
—Saul Bass

The ultimate inspiration is the deadline.
—Nolan Bushnell

You can't do better design with a computer, but you can speed up our work enormously.
—Wim Crouwel

Computers are to design as microwaves are to cooking.
—Milton Glaser

It is not enough that we build products that function, that are understandable and usable, we also need to build products that bring joy and excitement, pleasure and fun, and, yes, beauty to people's lives.
—Don Norman

If you do it right, it will last forever.
—Massimo Vignelli

Everything should be made as simple as possible, but not simpler.
—Albert Einstein

Do good work for good people.
—Aaron Draplin

If you're not prepared to be wrong, you'll never come up with anything original.
—Sir Ken Robinson

Design is, literally, purposeful planning. Graphic Design, then, is the form those plans will take.

—Chip Kidd

Graphic Design, if you wield it effectively, is Power. Power to transmit ideas that change everything. Power that can destroy an entire race or save a nation from despair. In this century, Germany chose to do the former with the swastika, and America opted for the latter with Mickey Mouse and Superman.

—Chip Kidd

Graphical excellence is that which gives to the viewer the greatest number of ideas in the shortest time with the least ink in the smallest space.

—Edward R. Tufte

Typefaces are to the written word what different dialects are to different languages.

—Steven Heller

Visual communication of any kind, whether persuasive or informative, from billboards to birth announcements, should be seen as the embodiment of form and function; the integration of the beautiful and useful.

—John Clifford

HOME MAINTENANCE

There is no shame in breaking something, only in not being able to fix it.

—Hope Jahren

A man builds a fine house; and now he has a master, and a task for life; he is to furnish, watch, show it, and keep it in repair the rest of his life.

--Ralph Waldo Emerson

How many units of shingles will be needed for the roof? What size HVAC unit do you need to heat and cool the volume of a house that has a floor area of 3,650 square feet with half of the floor space having a 12-foot ceiling and the other half a 10-foot ceiling?

How many square feet of insulation do we need for the attic to achieve an insulation level of R-24? Is it cheaper to use fiberglass batting or blown insulation? If we use

blown insulation, what is the volume of 12 inches of insulation for the attic? Now we need to compare the cost of that volume of blown insulation to the square footage of fiberglass batting. And while we are on insulation, how many square feet of batting do we need for the walls? How many board feet of 2x4s and 2x6s do we need? What is the square footage of the outside 'wrap' of moisture barrier; how many linear feet of water pipe, copper tubing, sewer pipes, and wiring are needed; what is the required number of light fixtures, outlet boxes, fuse panels, etc.? Square footage problems must be solved to determine the areas covered by flooring, shingles, wall-board, and finishes. Is there a need for math skills here? Critical thinking skills? Planning?

—James Howlett and
Brad Huff

The time to repair the roof is when the sun is shining.

—John F. Kennedy

My mom said the only reason men are alive is for lawn care and vehicle maintenance.

—Tim Allen

I didn't have a drill, so I had to make my own. First I heated a long nail in the fire, then drove it through a half a maize cob, creating a handle. I placed the nail back on the coals until it became red hot, then used it to bore holes into both sets of plastic blades.

—William
Kamkwamba

She believed in getting as much use as possible from everything, and thought that as long as machinery, or anything else, could be cajoled into operation, it should be kept; to do otherwise, she thought, was wasteful.

—Alexander McCall
Smith

No one warns you how often you'll whisper 'righty tighty, lefty loosey' to yourself as an adult.

—<https://americasbestpics.com>



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