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ABSTRACT

The high schools of our country have to answer for the educational and career planning of boys and girls. An annual aptitude inventory--preferably of the eighth- or ninth-grade population--can yield information which will aid the schools (a) in curricular planning, (b) in identification of which and how many pupils possess various patterns of ability, and (c) in planning for a positive program of personal counseling. This assaying of abilities should cover the whole range of individual differences including the near geniuses and the less able; all are human resources. The well-advised selection by pupils of appropriate courses and curricula can prevent the waste of a considerable amount of human potential, with attendant effects of frustration and maladjustment for the individual. Constructively it results in the development of our human resources along socially useful lines, both in terms of society's needs and the individual's possibilities. (For related documents, see TM 002 847-848.) (Author)

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GEORGE K. BENNETT, *President*

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HUMAN RESOURCES AND THE APTITUDE INVENTORY

THE youth of our country are one of our greatest national assets. To those who recognize this as an orator's cliché, let it be said that clichés are stuffy only when they are substitutes for intelligent action on the problems posed by the truisms. We are agreed that the boys and girls in our high schools constitute a most vital national resource. It follows that our schools have the primary obligation to assay the qualities possessed by these human assets and to provide opportunities for their appropriate development.

In a comprehensive study of the school's responsibility for developing human resources we would need to review all of society's objectives in maintaining secondary schools and the many curricular and noncurricular plans for achieving them. In this paper we shall limit ourselves to the *discovery and development of abilities* — a major concern of those of us who bear responsibilities in educational and career planning.

Translating our human resources cliché into this particular educational concern, we ask: How can a school

- identify the abilities of each and every pupil,
- provide the educational opportunities for optimum development of the discovered talents, and
- guide each youngster into a program of training which is appropriate for him?

A considerable part of any educational curriculum is determined by long-accepted socio-educational values quite apart from training for careers. We want to train all pupils in certain basic skills and provide them with a background for good citizenship, irrespective of their abilities or career plans. Our concern in this paper, however, is mainly with the differentiated offerings — college preparatory, commercial, technical, trade, retailing, etc. — and with the matter of adjusting *levels* of instruction in the general areas to the needs and abilities of pupils who exhibit, as we all know, a very great range of individual differences.

We need facts — especially facts about these individual differences — to make our curriculum studies rational. These same facts about the range of individual differences and the proportion of pupils possessing the important human abilities are also raw materials for a good counseling program. Good counseling for careers (and the next educational steps toward them) requires that we have good information about each pupil. The stress here is on *each pupil*, because a resource-conscious guidance counselor is not concerned just with "problem cases" but with constructive planning for the optimal development of every pupil.

An Aptitude Inventory Can Help

To provide a solid basis for serving these two needs — sound curricular planning and constructive personal

ounseling – the modern school can well consider an *ventory of the aptitudes* of its school population.*

Schools have conducted *achievement* surveys for rs. In achievement test surveys administrators usua concern themselves with the quality of instruction a the schoolwide standards; teachers concern themse s with the status of each pupil in areas in which he as pursued courses of instruction. In an aptitude in tory we want to measure the abilities of our pupils so can determine

- what courses should be offered by the school, and
- who should take them.

The Aptitude Inventory and Society's Needs

At times, and especially in times of national emergency, it is vital that each young citizen be adequately prepared to fit into the world of work or into the next higher educational echelon. If the wrong youngsters prepare for college and if the wrong youngsters aspire to secretarial positions or to particular skilled trades, society is wasting its human assets. All of us who have counseled youth or attempted to rehabilitate frustrated and maladjusted young people and adults are aware that years of productivity are often lost. Society needs to reduce this loss of human productivity and its attendant crushing of the human spirit. Society is asking why so many students leave school before their graduation from secondary school. Society is asking whether there is a causal relationship between rising delinquency rates and failure of the school to meet the needs of these aberrant boys and girls, so many of whom are not ready for any occupation when they drift out of school.

The beginnings of this wastage can often be traced to decisions made (or not made) in the ninth grade. We feel, therefore, that a school system should carry out its aptitude inventory near the end of the eighth grade or early in the ninth grade.†

This period is the first major choice-point in the careers of young people. Although all of us would resist "freezing" a boy or girl into an unalterable career plan, it is clear that society would be better served if high school plans were made with the assistance of more fact-based counseling.

Some wastage of human resources arises from the misplacement of youngsters in existing curricula. We can reduce this wastage by effective counseling based on facts from our aptitude inventory. However, much of this socio-economic loss arises from a lack of appropriate curricular offerings. An aptitude survey can be part of a community study to determine what the school *should* be offering its population of boys and girls with wide divergencies of talents. This is important, and will be discussed (with real-life illustrations) later in this article. The school can use its aptitude inventory to awaken the community to the need for a richer school program.

The Aptitude Inventory and the Individual

From the viewpoint of the individual himself, it is terribly important that his educational missteps be kept at a minimum. Here are only a few examples of the kinds of "cases" counselors see:

- The boy, overly ambitious in the light of his abilities, who must shift his plans in mid-high school.
- The family with unrealistic ideas about its children.
- The superior girl who doesn't recognize her opportunities.
- The pupil from an immigrant or low economic background who settles for an occupational level below that which he is capable of attaining.
- The average performer, thought to be of average ability, who tests very superior and only then is identified as having a reading disability, or a severely maladjusted personality, or difficult home situation.
- The academically "dumb" boy who is gifted in mechanical ability.
- The pupil who is not mentally retarded by official standards but whose test profile is flat – around the 10th percentile.
- The girl with all her tested abilities below aver-

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*In an aptitude inventory we mean more than recording the IQ of each pupil or his subject matter achievements. An inventory of aptitudes is accomplished by a group of tests of special abilities, such as verbal ability, space perception, clerical aptitude, etc. Some schools will use a collection of standardized tests from several sources while others will prefer one of the newer aptitude test batteries specifically developed for guidance purposes.

†There may be local reasons for locating the testing project in the tenth grade. Or, during the first year, the school may embrace grades 10 to 12 in its aptitude survey.

age, except on simple speed and accuracy tasks where she is in the uppermost ten per cent.

- The girl in the "socially acceptable" secretarial course who is failing because she has below average language skills, and whose better-than-average strength in numerical ability, space perception, and mechanical comprehension has never been recognized.

To these items from the counselor's case book, the reader can add his own evidence that career choices and the educational planning for them are extremely important matters for the adolescents who face their ninth- or tenth-grade decisions.

Many pupils at the time of entering high school seem to have no serious problems in making decisions; their plans are reasonable from the viewpoint of their family, the school, and their own ideas. Others are misfits and realize it – they seek out the counselors directly or are referred for counseling by teachers. Still others are not well-adjusted but do not know it. They may seem happy but are working far below capacity; some of them later say, "I wish I had known." Others may be somewhat unhappy about their achievements or opportunities but work stolidly along because they have been led to accept their status as inevitable. Some may be failing badly, either in their own eyes or only in the estimation of their parents, but see no need or chance of challenging the educational groove in which they are slotted.

Thus we observe that besides providing a school with objective data for curricular planning, an aptitude inventory can also enrich the bases for personal counseling of all the students for whom discrepancies in case data are apparent. The counselor will not just wait for self-initiated counseling to occur. He will assume positive responsibility to work for a more rational utilization of the abilities of each and every pupil, considering him both as a person and as a human resource greatly needed by his fellow-citizens.

Schools agreeing that such an aptitude inventory seems like a sensible idea should give all their late eighth- or early ninth-grade pupils a test battery. What shall they then do with the profiles? First, copies should go to the counselo so he can use them on referred and self-activated cases. Second, the guidance or research director can make the systematic analysis of the school's talents. The raw scores and profiles provide a wealth of data which need interpretation. In the following paragraphs a few examples of such analyses are given to illustrate the kinds of questions one can ask of the data and some of the implications for action which come from the answers.

Some Questions the Aptitude Inventory Can Help Answer

Here are two questions which every school should be able to answer about its pupils:

- How many – or what proportion – of our students are *superior*? That is, how many rank high on most or all of the abilities commonly considered necessary for advanced training at the college or technical school level?

- How many – or what proportion – of our students are *inferior*? That is, how many rank so low on so many commonly demanded abilities that they will have difficulty in profiting from the usual academic and technical school programs?

These are not new questions. Educators and social philosophers have been concerned with them for many years. Many volumes have appeared on the "gifted" and the "mentally retarded." Others have been written about the requirements and standards for college education. Currently many are concerned with the problem of allocating the less academic student to appropriate trade school courses and are unhappy about the dumping of the less able into the "general course," whatever that means.

Consider the data available on about 1400 boys and about 1700 girls who took the *Differential Aptitude Tests* in their ninth grade. These pupils are from several school systems but are gathered here into one analysis to provide large enough samples to yield stable, illustrative data. There are several possible analyses of their talents but only a few are shown here to illustrate how an *objective analysis of measured abilities* can yield stimulating information to administrators, counselors, and teachers.

For our first analyses we decided that ranking at or below the 40th percentile score on a given test would identify a "less able" person on the ability measured by that test, and that ranking at the 60th percentile score or above would be considered indicative of superior ability. With these standards, Tables I and II were prepared.

TABLE I. Proportion of pupils defined as superior by tests

Percentage of Pupils at 60th Percentile or Above		
	Boys	*Girls*
1. On the Verbal Reasoning Test	47	40
2. On both the Verbal Reasoning *and* the Numerical Ability Tests	32	28
3. On the Verbal Reasoning, Numerical Ability, *and* Sentences Tests	24	21
4. On the Verbal Reasoning, Numerical Ability, Sentences, *and* Spelling Tests	18	15
5. On the above tests *and* the Abstract Reasoning Test	14	12
6. On the above tests *and* the Mechanical Reasoning Test	9	9
7. On the above tests *and* the Space Relations Test	8	7
8. On the above tests *and* the Clerical Speed and Accuracy Test	5	5

The Superior Group

While it is impossible to state exactly what ability levels in particular talents are necessary for successful work in a college with reasonable standards, we are willing to assume the "upper 40% rule" as being an approximately correct and tenable standard. We also know that the first four of these tests in the above analysis — Verbal Reasoning, Numerical Ability, and Language Usage (Sentences and Spelling) — are consistently good predictors of academic success.

Thus it appears that about one-sixth of the pupils (18 per cent of the boys and 15 per cent of the girls) should *certainly* have an *opportunity* to prepare for post-high-school education of some sort. If we assume high V and N abilities to be evidence of college-level aptitude for learning, the proportion is about 30 per cent. These boys and girls probably can complete almost any college curriculum. There will be reasons why not all of them will want to plan for college; some will not see their way clear to plan for college. But if a community really believes in conserving and developing its human resources, it will see to it that *not one of its boys and girls who meet the above standards of aptitude excellence will fail to prepare for college just because the talents were unrecognized by the pupil, the family, or the school.* Furthermore, a responsible school will try to recognize these talents early, at least as early as the ninth grade.

The modern community will ask its schools to provide counseling services for those with high talents whose aspirations stop short of their potentialities or who, for some reason, do not seem able to function at a high level. Such a school will insist on appropriate remedial programs to help these generally bright students overcome any special handicaps which are holding them back, such as inadequate reading skills or language skills.

This modern school will not force nor coerce its superior students to plan for a formal college education, but it will encourage those who have other plans to set their sights high in preparing for whatever vocation they choose to enter. For example, our best secretaries tend to come from among girls with high abilities who do not go to college.

Look now at a smaller group — the 5 to 8 per cent of boys and girls who are defined as superior on seven, or all eight, of the tests. These youngsters are "naturals" for the professions and scholarly careers. A talent-conscious school will at least be aware of these boys and girls — *name by name* — and leave no administrative stone unturned to help each of them know and appreciate the academic and technical levels to which he or she can reasonably aspire. Naturally, most of these bright pupils will be high-level achievers, but this is not necessarily so; our case books are full of under-achievers — each of whom is a counselor's challenge.

To illustrate, consider a ninth grader in a terminal agriculture course, a goal based on genuine interest. But, the local *DAT* survey spotted him as a boy with all but two of his abilities rated above the 75th percentile (80, 90, 75, 88, 87, 23, 50 — across the *DAT* profile chart); his below average scores in Language Usage are in remediable areas and reflect the limited quality of his elementary school. In conference with his parents and counselor, this boy shifted to the college preparatory program heading for the university's agricultural science degree — and is doing A-grade work. The counselor has discovered a national asset and set him on his way toward contributing to society in a bigger way than he had imagined he could.

The Less Able Are Assets Too

Question 2 was about the less able pupils, the identification of those who cannot be expected to succeed in the higher-level technical or academic programs. By statistical definition, they are just as numerous as the generally superior children. (For the present illustrative discussion we are neglecting the great middle group.)

We note in Table II that 4 per cent of our boys and girls are at the 40th percentile or below on all eight of the *Differential Aptitude Tests*. There are 7 per

cent who are low on all but the Clerical Speed and Accuracy Test, which we arbitrarily put last in the series for this discussion.

TABLE II. Proportion of pupils defined as less able by tests

Percentage of Pupils at 40th Percentile or Below	Boys	Girls
1. On the Verbal Reasoning Test	45	41
2. On both the Verbal Reasoning *and* the Numerical Ability Tests	30	25
3. On the Verbal Reasoning, Numerical Ability, *and* Sentences Tests	21	19
4. On the Verbal Reasoning, Numerical Ability, Sentences, *and* Spelling Tests	15	14
5. On the above tests *and* the Abstract Reasoning Test	12	11
6. On the above tests *and* the Mechanical Reasoning Test	9	8
7. On the above tests *and* the Space Relations Test	7	7
8. On the above tests *and* the Clerical Speed and Accuracy Test	4	4

The 30 per cent of boys and 25 per cent of girls at or below the 40th percentile on *both* the Verbal Reasoning and the Numerical Ability tests usually are not "college material," although some will plan for college, some of these will be admitted, and a few will graduate. Some of these non-scholastic boys and girls have other talents which can be identified by other tests in the aptitude inventory or by other appraisals added on a case basis later.

Concentrate now for a moment on the 4 to 7 per cent who are untalented in general on the abilities measured by this battery of tests – abilities which are commonly demanded by one or another of the several high-school curricula. They are not feebleminded, since the feebleminded rarely get through elementary schools. These are the pupils who can learn at an *appropriate level of difficulty*, but just do not profit very much from the conventional academic program. Among them will be some superior athletes, singers, dancers, and some with superior motor coordinations valuable for the crafts. But there will be just as many without abilities compensatory for their academic handicap; these are just all-around low-ability people – whose education for citizenship, earning power, and general living is nevertheless among our educational interests and obligations.

An inventory of pupil abilities, one small segment of which is shown in Table II, does tell us

- how many pupils are below whatever criterion we set to differentiate the less able from the more able, and
- who they are.

With facts such as these the administrator can develop a pupil personnel "manning table" to assist him in setting up the proper courses and the number of sections of each that are needed in the system. The counselors, having identified these pupils by name, can set about inspecting the status and progress of each and advising changes in program where such are indicated. The counselor does not wait until "crisis counseling" is necessary nor does he belatedly conduct "drop-out" surveys to find why these pupils leave school as soon as is legally possible. As with the brighter group, he seeks them out and, consistent with a good mental hygiene philosophy, he anticipates any potential crisis and averts it if possible. He will find great satisfaction in seeing some of these frustrated boys and girls rise to substantial accomplishment, better emotional health, and responsible citizenship when they find themselves in programs which they are able to master and which head them toward realistic goals.*

The Really Low Ability Case

Every counselor has seen a few profiles with every test rating in the lower quarter, or even with almost flat profiles below the fifteenth percentile. Having satisfied ourselves by carefully reviewing all evidence that the facts describe such a youngster, we find ourselves even more challenged to find a place for him in the school. What courses can he take? How many are there like him? Who shall teach him – and how?

Every pupil is a worthwhile person and a potentially useful citizen. We must develop special skill in counseling these low-level students, many of whom already have been subtly or brutally rejected by the teaching staff and parents and most of whom will be drags on society unless here and now we help them get ready for a useful life. As counselors – armed with the facts from an aptitude inventory – we can hammer away at the importance of a suitable array of courses *into which* to counsel this small but important segment of our resources.

Indiscriminate "dumping the dumb" into the trade courses or the "general commercial" course is neither an ethical nor a practical solution. Many maladjustments will occur. The costs of administrative actions involving failures and the costs of readjustive counseling with pupils and parents are great.

* For this argument, and much else in this paper, the writer acknowledges a debt to the persistent emphasis of leaders in counseling on the positive mental hygienic approach to counseling. Williamson's recent paper (*Occupations*, December, 1950, page 182) is a forceful statement of the viewpoint.

A constructive approach might be developed along these lines:

- Pupils should be positively *selected* for the less-demanding curriculum in the light of whatever differential facts are seen in each pupil's aptitude and achievement records, his expressed interests, and his opportunities for post-school employment.
- Courses should be introduced to meet their needs specifically.
- The general education courses, those which are important to all future citizens, should be taught at various levels to accommodate the ability levels of the pupils. The change, however, must be more than establishing special sections or simply washing down American history by teaching battles instead of basic principles. Ingenious methods and new content are needed; the best teachers are needed.

To help accomplish these three positive plans for developing the less able pupils as national resources, an annual aptitude inventory is helpful because it permits a marshalling of relevant facts on which to base decisions.

Of course many other kinds of facts and social viewpoints are also relevant, such as knowledge of the occupational opportunities for graduates of special curricula. (We are reminded of the trade school that graduated more bricklayers one year than there were adult bricklayers in the community!) There is also the matter of community readiness to diversify its curriculum. There are notions of social status among parents in the community which make placement in some programs difficult. There are overtones of class status and social mobility to consider.

With respect to this last point, counselors report that objective facts about a boy or girl are essential in counseling; parents, sometimes very slowly, will come around to the wholesome view of having their youngster carry a program which makes objective sense regardless of unconscious or preconceived notions of status. But there must be facts which show that it does make sense.

What Kind of Mathematics?

Figure 1 shows two viewpoints with regard to a perennial question — who should take algebra?

In School F, two quite different courses are offered, algebra and practical mathematics. About one half of the pupils take each course. The difference between the profiles of the average pupil in each course indicates that in this school algebra probably can be taught and learned as a college preparatory subject. Nearly all of the algebra students are above average in the relevant abilities, many in all the abilities measured. The profile of the students in practical mathematics shows that a majority of these students are below the profile of the average student in the school.

In School M, those taking ninth-grade algebra are not very much different from those who do not take this course; ability seems to play a less important part in deciding who shall enter this course at the ninth-grade level. In School M, it happens that at the end

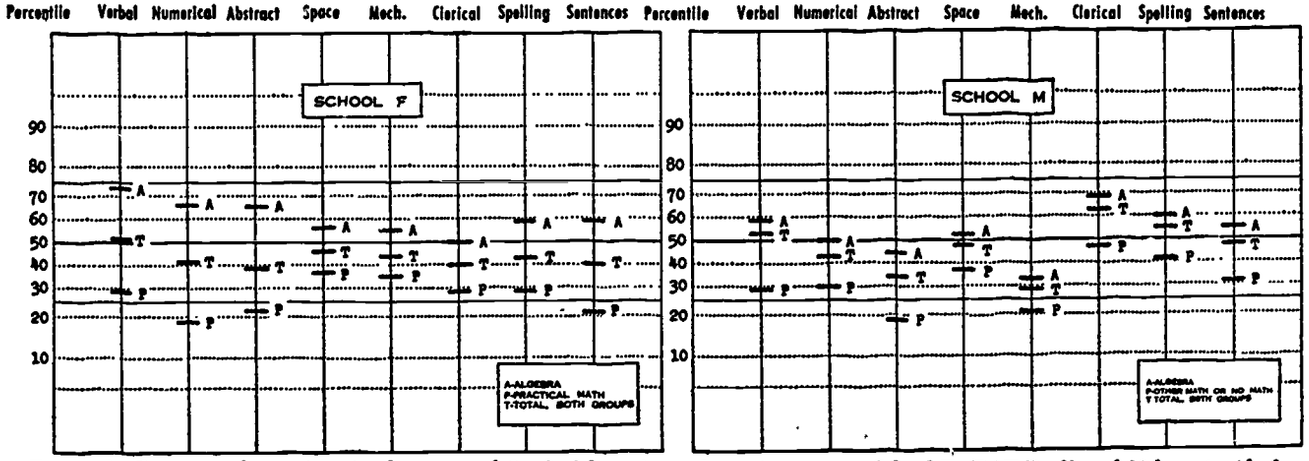

FIGURE 1. Practices of two cities in placement of Grade 9 boys in mathematics courses. School F: DAT Profiles of 83 boys in Algebra and 80 boys in Practical Mathematics. School M: DAT Profiles of 225 boys in Algebra and 86 boys in other mathematics courses. (Note: In this and succeeding figures, the mean raw score for each group on each test has been converted to the equivalent percentile on norms given in the test manual.)

of the eighth grade a pupil either enters a commercial program or enters what is essentially a college preparatory course, although a little leeway in program is possible. A very few leave the public school and enter a state-operated vocational school. The boy or girl who does not want commercial training but wants a college preparatory course even less is often really stuck.

The reader can well ask, what have test profiles, derived from the aptitude inventory, to do with this situation? Is not this just an ultra-conservative community whose philosophical viewpoint must be changed? The guidance director of School M, alert to research opportunities and genuinely concerned about the welfare of boys and girls, set out to change the community's set of values. Besides using the *Differential Aptitude Test* profiles for personal counseling, he recognized that his counselors were severely limited because they could not offer *choices* to the students. He started with facts, like those in Figure 1 and Tables I and II, developed from his own ninth-grade data. These tables and charts went with astute emphasis to the superintendent. He began by showing the need – in terms of the children's talents – of differentiated mathematics courses. He pointed to another survey about the excessively high rate of "drop-outs" in his community. He asked: Why should all these kids take algebra? Can they use it? Does the present program lead to discouragement so boys and girls leave school before they are ready? He posed alternate goals, mainly a group of non-collegiate technical and trade courses to parallel those now given in the commercial field and also more appropriate placement of pupils within the commercial curriculum.

What about Mechanical Ability?

The guidance director of School M found other facts too. For example, over 30 per cent of those who were in the *lowest quarter* on Numerical Ability (and thus probably not of college calibre) were *above average* in Mechanical Reasoning. Yet – no special four-year program for them was possible; they were unrecognized as community assets so far as vocational preparation in school was concerned.

— and Bookkeeping and Stenography?

Non-academic boys frequently were dumped into the commercial department, with no regard to their interests or abilities. The director found that the general level of the students in the Commercial High School was not very promising for the business and industrial firms of his city who looked to it for bookkeepers, typists, secretaries, etc: Figure 2 indicates the low over-all average of this group in comparison with those who did not elect the commercial program. This picture is serious when one knows that secretaries ought at least to be above average in the verbal, clerical, and language abilities.

Among the commercial school boys nearly 50 per cent were in the lowest quarter on the norms for all boys, yet these pupils were required to take the formal bookkeeping course. Substituting bookkeeping for algebra is no sensible solution for most of these boys. Prob[illegible] they need some basic training in personal fina[illegible] d general business and some will be highly motivated to succeed in a way in bookkeeping, but most of them will be unsatisfactory, and probably unhappy, bookkeepers!

These facts – derived by School M from its aptitude inventory – were the guidance director's ammunition

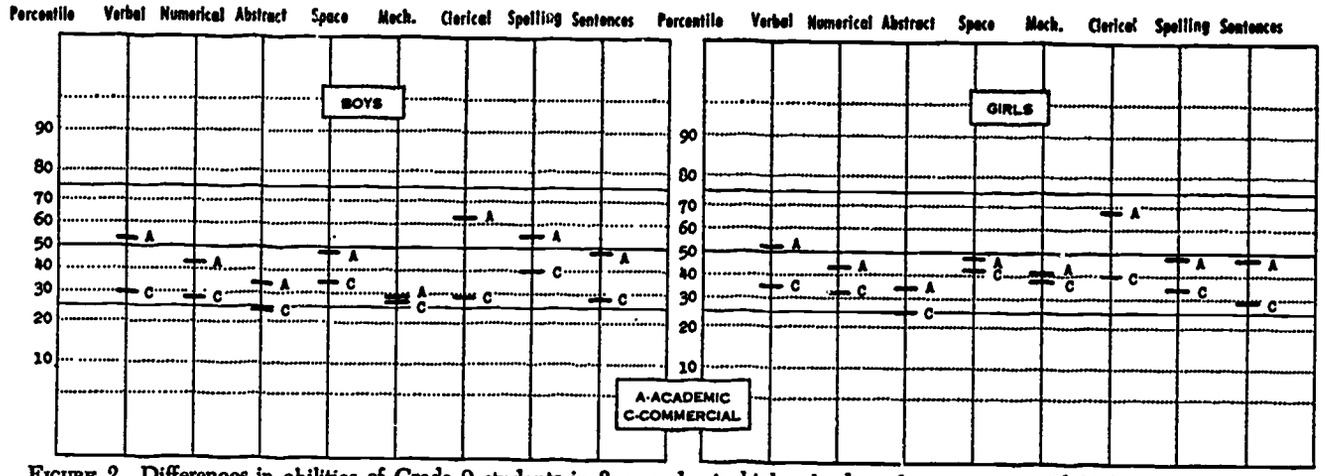

FIGURE 2. Differences in abilities of Grade 9 students in five academic high schools and one commercial high school in one city. Girls: academic, 319; commercial, 111. Boys: academic, 311; commercial, 78.

in forcing schoolwide and communitywide thinking about the curricular needs of School M.

More about Mechanical Ability

Let us go back to the larger groups described in Table II. These cases can be analyzed in other ways. Among other items of interest, for example, we found that 30 per cent of the boys were in the lowest 40 per cent on *both* Verbal Reasoning and Numerical Ability — rather clear indication that scholastic aptitude was probably not their strongest asset. As a matter of fact, few colleges would admit them. Of these approximately 400 boys destined for some other sorts of careers, many are low or average on other tested abilities as well. Some can enter special trade or technical programs in a setting, we hope, that provides what they need and can master. Further analysis of the data revealed that 20 per cent of this 30 per cent are superior in both Space Relations and Mechanical Reasoning. The 20 per cent of the 30 per cent are only 6 per cent of the total ninth-grade boy population; however, in a community or county with a thousand ninth-grade boys there are probably 60 who, although scholastically inferior, are of such superiority in mechanical aptitudes as to warrant very special attention. An aptitude inventory helps the school recognize this small, high-asset group very early and start them on the right track. They probably can fill the community's normal needs of mechanical craftsmen.* Their early selection is a positive step toward effective usage of a nation's natural resources, as well as a process for promoting better adjustment of the boys themselves to their school and the world of work.

A Question of Philosophy

Consider another community's problem, illustrated in Figure 3. These profiles are from School K in a big city; the children came mainly from homes of industrial workers. The pupil-personnel psychologist first felt that the Language Usage scores were too low, but two longer achievement tests corroborated the low status of these boys and girls. The psychologist wrote us: "If it comes out that the group is non-verbal, what do we do? After all, these students have had eight years of school in the best conditions we could provide and with the best teachers available. The students have been exposed to reading, writing and arithmetic. It may be we should build on strengths. Perhaps we should conclude they are non-verbal and stress their strengths . . ."

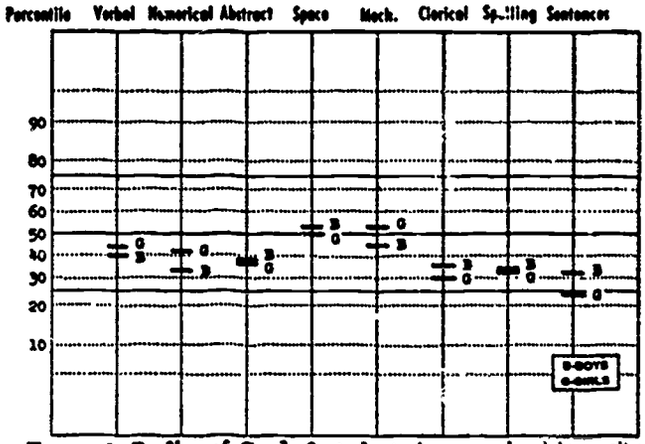

FIGURE 3. Profiles of Grade 9 students in one school in a city having several schools at this grade level. On national norms, their standing is average on two tests and considerably below average on others. Boys, 140; girls, 145.

The aptitude inventory provided a challenge to those who determine the philosophy of School K. Should they invest in more and better teaching of fundamentals of English? Shall they strive for only a modest level of practical English and invest staff time and facilities in courses which capitalize on the talents represented by the Space Relations and Mechanical Reasoning Tests? What other alternatives are there?

The test data, like other data, do not diagnose or prescribe — they do, however, provide an inventory of facts which enable resource-minded and socially perceptive educators to plan more responsibly for their communities.

In Summary

The high schools of our country have to answer for the educational and career planning of boys and girls.

An annual aptitude inventory — preferably of the eighth- or ninth-grade population — can yield information which will aid the schools (a) in curricular planning, (b) in identification of which and how many pupils possess various patterns of ability, and (c) in planning for a positive program of personal counseling. This assaying of abilities should cover the whole range of individual differences including the near geniuses and the less able; all are human resources.

The well-advised selection by pupils of appropriate courses and curricula can prevent the waste of a considerable amount of human potential, with attendant effects of frustration and maladjustment for the individual. Constructively it results in the development of our human resources along socially useful lines, both in terms of society's needs and the individual's possibilities. — HGS

* And for evidence that this vocational line can lead to $5,000-$10,000-a-year rewards, see *Occupations* for April, 1951, pages 543-544.