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ABSTRACT

Society in general, and the field of educational technology as a particular example, has amply rewarded specialization, and generally ignored and denigrated generalists. While the complexities of modern society and the knowledge explosion do require many specialists, there are disadvantages to both the society and the individual in relying too heavily on specialists who cannot see the broader picture and who can become obsolete. The need of our society for a variety of integrative skills calls for a greater production of generalists: not jacks-of-all-trades, but people who have studied intensively, but not exhaustively, in a number of areas. (RH)

AREA OF IN

No. 4

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ABSTRACT

The paper examines the question of whether our educational system, with emphasis on educational technology, should produce generalists or specialists. The introduction, relating the issue to the Area of Instructional Technology, is followed by an historical background to the issue. The terms 'generalist' and 'specialist' are defined with the aid of a conceptual model.

Cases are made for and against both generalization and specialization in society. The complexity of our society, with its vast information otuput, is cited as the case for specialization. The case against specialization is composed of seven potential disadvantages to specialists and/or society. The case for generalization is supported by seven factors which indicate the increasing demand for integrative skills in our society. The case against generalization is more appropriately a caution against the improper training of generalists.

The author finds that specialists are important to society and have been so recognized. On the other hand, the generalists, who are at least as important as the specialists, have been denigrated and given low esteem. The author suggests that the production of generalists is not only justified, but should be more actively pursued.

THE GENERALIST-SPECIALIST ISSUE

Albert Beilby

Syracuse University

INTRODUCTION

This paper explores the issue of whether the Area of Instructional Technology at Syracuse -- or even society -- should produce generalists or specialists.

I've chosen to explore this issue for two reasons. First, the very ambiguousness of the issue encourages few people to comment on the issue with any degree of precision. We casually refer to specialists and generalists, with some implicit assumption that those addressed will understand what we are talking about. Furthermore, while many writers mention the issue, there appears to be no comprehensive paper addressing the issue. The problem of writing such a paper intrigued and challenged me.

The second reason for exploring the issue is less easily explained. A number of students in our department appear ill at ease with what I see as a paradox within the department. Giving lip service to the prevailing attitude of society that specialization is the most useful approach to life, faculty and students encourage specialization in educational technology. Two things influence the pursual of this "goal." First, the department is understaffed, thus limiting the capacity to offer variety of specialization. Second, these in the department have a "gut" feeling that they should produce a "well rounded" person. As a result, the students, conscious of the respectability of specialization, and the "second class citizenship" of the generalist reflected by both the department and society, find themselves becoming reluctant generalists. Therefore,

I believe there is a need for this paper, at this time, to examine and possibly legitimize the role of the generalist in educational technology.

HISTORICAL PERSPECTIVE AND DEFINITIONS

Whether a student should become a specialist or whether he should, by studying broadly in several areas, become a generalist is a question that has been long debated. Aristotle is said to have cautioned against one's learning to play the flute too well lest he neglect other matters of importance. An earlier countryman of Aristotle, Heraclitus, believed change was the only reality and permanence was an illusion. To spend time studying any single subject was thus considered fruitless; general knowledge enabling one to cope with change was what mattered.

There have, however, been specialists throughout history. In primitive societies, the shaman or witchdoctor was a kind of specialist. In like vein, the medieval court-jester, the weapon-maker, the alchemist, the scribe, and the blacksmith were all specialists. It's doubtful that the concept of specialist had any meaning to their peers, however. Only with the advent of formal learning in academic settings did the concepts of generalist and specialist acquire meaning, and then only as a reflection of the use to which students put their education. Indeed, most students enrolled in 17th century European universities received essentially the same education. Most of them entered the professions of law, medicine and the clergy (specialists), while a few became "men of letters" or generalists (Chamberlain, 1970). This practice led Francis Bacon to comment that all the colleges of Europe appeared to be "...dedicated to the professions...[and none to]...arts and sciences at large."[1] While one who applied

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[1] Bacon, Sir Francis, Of the Advancement of Learning (1605), as quoted by Chamberlain, Philip C., General vs. specialized education: source of institutional tension, Educational Technology X, May 1970, p. 50.

knowledge toward utilitarian ends may have been a specialist, he became "legitimate" only after the Renaissance when he acquired his knowledge through formal education. Thus, a blacksmith or chimney sweep would not be considered a specialist.

By the time this nation became established, two characteristics of a specialist were recognized: he had to have some formal training in institutions of higher learning, and he had to apply this learning in a particular manner, that is, in the "professions."

In the early years of this nation, the prevailing attitude was that a fixed body of knowledge should be pursued for its own sake. This fixed body of knowledge consisted of the study of ancient languages, such as Latin and Greek, of mathematics, and of other forms of the arts and sciences. Today we would describe such an education as liberal or general; at that time it was deemed adequate for preparation for whatever profession (specialty) one intended. But the nature of education available in these institutions began to change in the last half of the 19th century. The introduction of the elective system, the creation of the Morrill Land Grant Act, the rise of service oriented universities, as well as increasing technology and industrialization, were factors that influenced higher education to offer vocationally oriented subjects (Chamberlain, 1970). These vocationally oriented subjects became the basis for a change in the meaning of the concept specialist. No longer would the educated man become simply either a member of the ancient and honorable professions, or a learned man of letters. Agriculture, merchandizing, and other "lowly" vocations became subjects of study and potential avocations for those with college degrees.

Alfred North Whitehead, an English scholar who taught at Harvard at the turn of the century, described first-hand the implementation and growth of specialty education at Harvard during that time. Having come from Cambridge and Oxford, where students became specialized by their self-selected readings and faculty associations, Whitehead

was surprised to find graduate school complexes being constructed in places remote from the rest of the University and equipped with their own special staff. Whitehead commented that Americans liked this idea of a "plurality of champion specialists." He drew the analogy that evidently Americans felt they could put together an all-star culture and economic team from these specialists in much the same manner they put together all-star baseball teams containing a champion pitcher and catcher. Other Ivy League colleges, as well as a few public and state universities, began to follow the Harvard example. Whitehead noted that to stock these graduate schools, Americans deliberately sorted out the brighter students and persuaded them to continue their education (Fuller 1969).

Thus we see the meaning of specialist changing from any person entering a "profession" after some higher education to any person choosing and directing his higher education toward a specific profession. With the adoption of more utilitarian subjects in higher education, specialists as we now view them, began to emerge in the form of biologists, engineers and other "experts."

The specialist of today is even more restricted in his area of expertise than the early experts. Until about the 1930's or '40's, a college biology instructor could move with ease from one biological subject area to another. But today, as Henry Winthrop, chairman of the Department of Interdisciplinary Social Science at the University of South Florida, observes, the biologist who teaches physiology could not be called upon to teach genetics in higher education. And neither could the biological ecologist teach microbiology. In fact, Winthrop hypothesizes that it might be easier for a mathematician to prepare to teach the genetics course than for a physiologist to do so (Winthrop, 1966).

The specialist today is an expert in a very restricted area. In our own field of educational technology we have specialists in simulation, CAI, and film production,

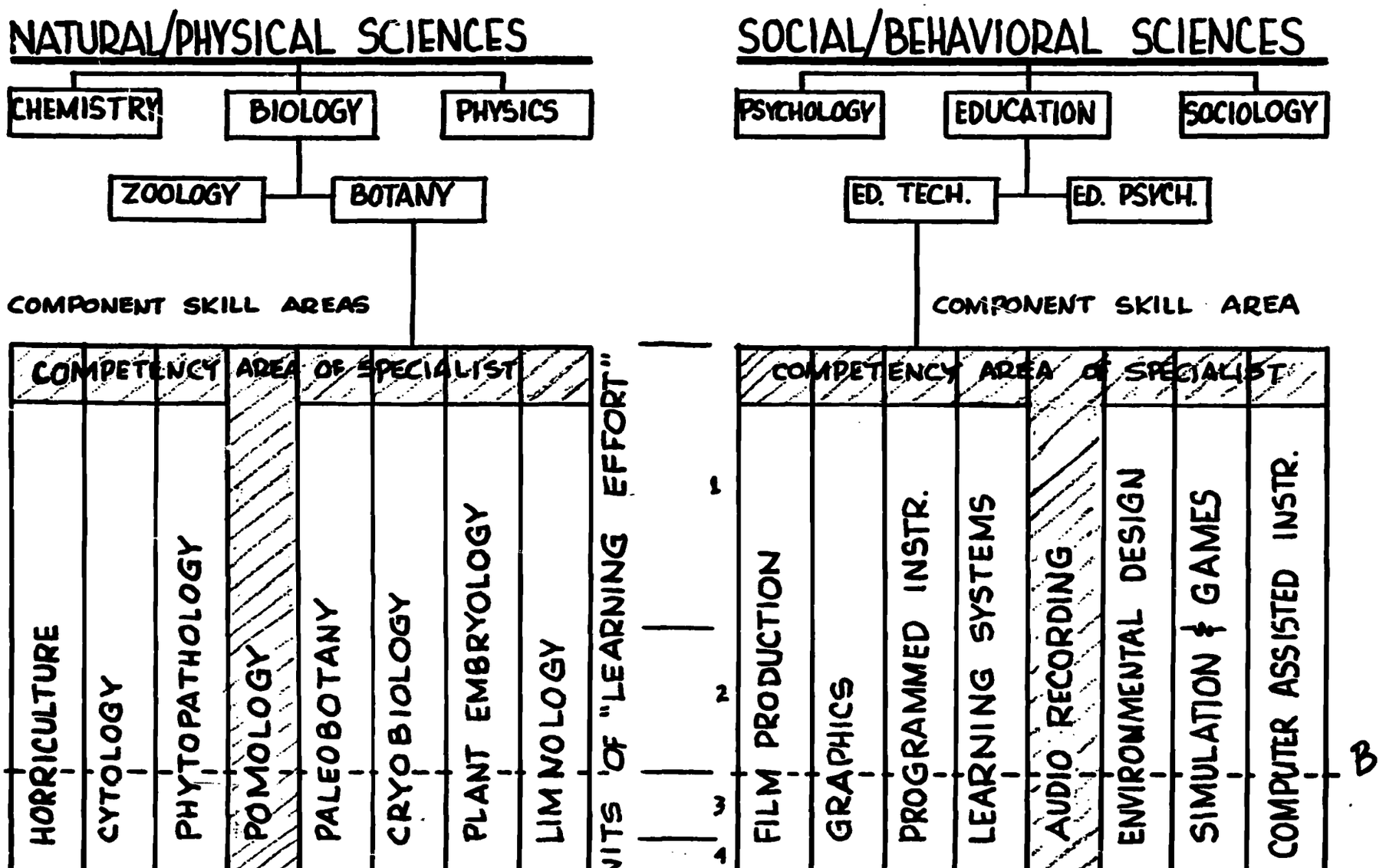
just to name three.

We can now define "specialist" as an individual who has studied intensely in a single area at the graduate level, and who works in that area after receiving his degree. But there is a problem here: not everyone can agree as to the specificity of that "single area"; does it refer to education? educational technology? Computer assisted instruction? We have the limits of the English language to contend with.

Figure 1 is an attempt to place some parameters around "area" as used in the definition above. Shown are simplistic taxonomies of both the social sciences and the natural/physical sciences. Under the natural/physical sciences, biology is broken down into zoology and botany. Botany is in turn broken into some of its component skill areas. In the social sciences, educational technology is treated as being of a similar order of magnitude as botany is in the natural sciences. Some component skill areas of instructional technology are given. It is the component skill areas -- not just in educational technology and botany, but in countless other fields -- that are intended by the words "single area" in the above definition of specialist. For discussion purposes, we are now ready to define a specialist as an individual who has studied intensely in a single component skill area at the graduate level, and who works in that area after receiving his degree. The shaded portions in Figure 1 indicate the study areas for two specialists: a pomologist in botany, and a simulation and gaming expert in educational technology. These specialists have some knowledge in other areas of botany and educational technology respectively, but that knowledge is limited when compared to knowledge of their particular specialty.

Insert fig. 1 about here

We must now deal with a definition for generalist. A crude attempt to portray



ILLUSTRATIVE COMPETENCY AREA FOR GENERALIST AND SPECIALIST

FIGURE 1

some study areas of a generalist is indicated in Figure 1 by the area above the line AB. A logarithmic scale, measured in units of "learning effort", is shown to call attention to the fact that not all knowledge in the component skill area is equivalent, and the different amounts of time and effort are required for various learning tasks. "Learning effort" is an abstract term without any real measurable dimensions. However, it is a useful concept to equate time and effort required to learn otherwise unrelated subject matter. For example, if we could state that a unit of learning effort was X hours of study and required Y joules of energy, we could also specify the number of units of learning effort required to become an expert in computer assisted instruction. We could go further and say that for the same amount of learning effort, one could also master a survey course in instructional technology, plus introductory motion picture, plus instructional systems, plus graphics, plus introductory simulation.

Of course, we cannot make such statements with our current scientific knowledge, but we can use the concept of "learning effort" to illustrate that it is possible to pick up some knowledge over several areas with the same amount of expended effort as would be required to pursue one particular content skill area to its limits. The six units of "learning effort" shown are an arbitrary result of trying to illustrate the abstract concept of learning effort with Figure 1; no significance is intended by that number.

Ideally, in the boxes"labelled component skill areas of Botany"and "component skill areas of Educational technology", the areas lying above the line AB in each box should be equal to the shaded areas in the respective boxes. And in the case where the areas were equal, some of the area above the line AB should come from bodies of knowledge which are not shown. That is to say, some of the area might come from such fields of study as sociology, economics, psychology and other fields outside of

either botany or educational technology.

The manner in which the student approaches the educational experience also determines the nature of that experience. Philip C. Chamberlain (1970), associate professor of higher education at Indiana University, tells us that the approach to a general education is one that is essentially philosophical. Such a philosophy might be described as studying in many varied fields in an effort to gain a wide knowledge base from which one might interact with a wide variety of people. Our definition for generalist then, is an individual who studies intensely at the graduate level to attain extensive knowledge in several related fields, and who develops a philosophical rationale for these studies.

THE CASE FOR SPECIALIZATION

Chamberlain (1970) observed that a premium has been placed on specialized education, but noted that this is a relatively recent phenomenon. Two corollary reasons for this emphasis on specialization can be identified. First, there is the increasing technical complexity of a modern world geared to expanding consumer desires for convenience and to national policies that give high priority to complex weapon systems and space technology. Second, we have the general information or knowledge explosion. The increasing complexity of what needs to get done not only consumes knowledge, it also generates knowledge, seemingly at some exponential rate.

Alvin Toffler (1970) states that by even the most optimistic estimates, Europe could have produced only 1000 different manuscript titles per year prior to 1500 A.D. Four and a half centuries later (1950), Europe produced 120,000 titles in one year; at the 1500 A.D. production rate, it would have taken over 100 years to achieve a "library" of this size. Just ten years later (1960), Europe was producing nearly 1000 titles per day. Toffler goes on to state that in addition to this output, "...the United States government generates 100,000 reports each year, plus 450,000 articles, books

and papers. On a worldwide basis, scientific and technical literature mounts at a rate of some 60,000,000 pages a year," (Toffler, 1970. p. 30). Toffler's statistics are stated so as to "shock" the reader, but even when they are properly tempered, we cannot escape the fact that there is a prodigious increase in output of information every year.

The implication of this duality of knowledge expansion and technical complexity is that people must pick and choose that which they would know and do. Furthermore, people must depend on each other to supply information that they as individuals are unable to generate. So, specialists are necessary as resource people, both for generalists and other specialists, and they are necessary to operate in those extremely small but amazingly complex areas required, for example, to design cyclotrons or build solid state circuitry.

There is little doubt that this need for specialists will become increasingly important. Toffler (1970) forsees the need for "armies of highly trained specialists" to run the technologies of tomorrow.

The need for specialists as resource people has already been felt by most sectors of our society. Educational technology is but one example of an attempt to satisfy that need in education. Originally, the need was for skilled personnel to investigate and implement the use of audio and visual media in the instructional process. After some fifty years, a clear statement of needs for educational technologists almost defies definition, due to the myriad of "technologies" presently being utilized in education. There are now specialties within specialties. Of course there are degrees of proficiency, but no educational technologist can become truly expert in all of the specialties which are now regarded as part of the field. The intricacies and the wealth of knowledge required in computer assisted instruction, message design for various media, simulation techniques, learning theory, attitude and performance

measures, programmed instruction, and management of instructional materials centers -- just to name a few -- are such that no individual could claim to know everything about all of them. It may be that no single individual knows all there is to know about even one of these areas.

It's evident that, as in many other sectors of our society, the amount of knowledge required by an educational technologist is so immense that the task of learning it must be divided among many people. Thus there is a need for specialists in educational technology.

THE CASE AGAINST SPECIALIZATION

In the preceding section, we examined the need for specialists, not only in our society at large, but also within educational technology. Lest the reader be left with the impression that this amounts to a raison d'tre for training only specialists in educational technology, it is necessary to look at some of the disadvantages, and even dangers, of specialization. Surprisingly, or so it seems to me, most of the literature consulted for this study (see bibliography) expresses views not wholely in favor of specialization. A number of disadvantages of specialization have been voiced. For organizational purposes, we will first present potential disadvantages to the specialists themselves. Then we will explore the potential disadvantages to society at large.

Disadvantages to the specialists: One way that specialization harms the specialist is that it makes him a likely candidate for "future shock" through job obsolescense. Toffler describes the specialist as one who keeps up with change, but only in one narrow area. The specialist insulates himself from ghetto disruptions, university unrest and other movements for social, political and economic change - unless that's his speciality - by immersing himself in his work and study. While superficially

successful in this existence, "... he may awake one morning to find his specialty obsolete or else transformed beyond recognition by events exploding outside his field of vision" (Toffler, 1970, p. 31).

Others have noted the rapidity with which specialties become obsolete. George E. Arnstein while associate director of the NEA Project on Educational Implications of Automation in the mid-60's, commented that he had been "...impressed with the obsolescence of specialized knowledge..." during his work on the project (Arnstein, 1964, p. 22). We have ourselves been witnesses to job obsolescence. The most striking examples being in the glamour area of space technology. The plight of NASA engineers was, and continues to be, "news."

A second manner in which specialization appears to discriminate against the specialist is that, specialization appears to limit the variety of courses the developing specialist can take in his educational program, thus depriving him of knowledges and skills most useful in relating learning to living or knowledge in one field to that in another (Caswell, 1966). Data either supporting or refuting this statement is not plentiful. In what appears to be the best study of "educational benefits", the results were somewhat mixed (Pace & Milne, 1971). The study, a nationwide survey of college graduates and upperclassmen, asked, in one section of the survey instrument, for self-estimates of benefits they derived from their college experience. Relative to "...specialization for further education in some professional, scientific or scholarly field", 65% of the alumni and 70% of the upperclassmen felt they had benefited "quite a bit." In contrast, only about 35% of the respondants felt they had benefited "quite a bit" in "...understanding and interest in the style and quality of civic and political life." Similarly, while more than 60% of the alumni felt they had received much benefit relative to "writing and speaking - clear, correct, effective communication", fewer than 50% of the upperclassmen felt this way. Benefits in

"...art, music, drama..." were even lower for both groups.

The same study, however, showed that about 60% of the alumni and 75% of the upperclassmen felt they had benefited "quite a bit" in their social development, and approximately 40% of all respondants felt they had received benefit in "...skills and techniques directly applicable to a job."

Disadvantages to Society: The specialist is a person with a heavy investment in building an expertise in a narrow subject matter area. Further, the specialist is rewarded when he excercises his special skills. This heavy investment, coupled with a reward history, can lead some specialists to misapply their knowledge to the detriment of society. A humorous analogy can be drawn by considering a man with a chest pain. If he visits a cardiologist, chances are high that the pain will be diagnosed as a heart condition. If he visits an allergist, the pain might be traced to a high pollen count. A psychiatrist might trace the pain to a lack of mother love. No telling what the tailor might discover. In this sense then, the specialist has been defined as a "solution in search of a problem" (Geis, 1970). With so many professional people -- e.g., teachers, financial advisors, architects and others -- acting as behavioral change agents, it's important that they look beyond their special interests and determine whether there really is a problem and whether that problem can be appropriately solved through their specialty. In the field of educational technology, we should be aware that many of the behavioral changes we might wish to produce may require environmental modifications far beyond the scope of classroom and teacher (Geis, 1970). The problem may not be the specialist's to address; the danger is he will address it anyway.

In addition to the possibility of specialists misapplying their skills, society is faced with another variation of the specialist's limited vision. The specialists characteristically spend considerable time in professional study with little time

devoted to the social sciences or humanities. Chambers (1970, p.49) describes this as "...obsession with 'scientism' to the exclusion of non-scientific subjects and other modes of thought...", and expresses the opinion that it leads specialists to adopt a "...reactionary or 'status quo' attitude regarding social, economical and political problems." While such a position may seem desirable to some, there are others -- this writer included -- who would hold it to be counter-productive and short-sighted. The lobbying record of the American Medical Association over the past half-century is an example of such short-sightedness.

A third way in which specialization may be counter-productive to society is that specialists do not function well in a chain of command system. Professor William H. Read (1965), of the Graduate School of Business at McGill University notes that the expert can't wait for his advice to be approved at higher levels and frequently makes decisions at his own level. This circumventing of hierarchical decision making may not be entirely detrimental, but it can cause distress in some sectors of our society.

Perhaps the most serious indictment of specialization is made by R. Buckminster Fuller (1969) when he describes what he calls "Whitehead's dilemma."

After describing the earlier development of specialist schools at Harvard, Whitehead had proceeded to examine the selection of candidates for specialization, noting that only the more intelligent students were selected. These men of "intellectual integrity" gradually came to realize that other humans could not hope to understand what was going on in their specialty even as they could not hope to understand another's specialty. The "all-star" team concept encountered difficulty as the specialists found themselves unable to integrate their unique body of knowledge to society's advantage. Other people have been called upon to perform the integrating function, which we have described as the function of a generalist.

With the brighter people as specialists, the pool of people left to do the integrating was somewhat less bright. Fuller (1969, p.34) refers to them as "...a great residual pile of dull ones." Naturally, their "dullness" was of varying degrees. The "dullards" were siphoned off the integrating task in such a manner that the brightest of them dealt in relatively specialized areas for which they were duly rewarded, e.g., industrial management. Fuller believes that the "dullest" people enter the integrating field of politics and other public positions that represent the broader range of responsibility. He believes that this helps to account for the continuing and accelerating crises in world affairs.

The implication of Whitehead's dilemma is that those people who perform the integration function of the generalist and who attain very powerful positions in society are, for the most part, not the people best suited for such roles. At least not if we believe the roles should be filled by the ablest and brightest people. One would think it desirable to have a sizeable number of our most talented citizens as integrators rather than having them siphoned off and directed toward some area of study that may be complex, but is limited in scope.

A final way in which specialization seems to be detrimental to society lies in the belief by some that specialization does not encourage discovery. Specialists appear to be more concerned with finding new proofs to what they already know than they are with discovery that decreases their stockpile of unclassifiable data. The product of specialization appears not to be enlightenment as much as more specialization (Carpenter, 1970; Kaufmann, 1971). Such a situation is admirable to practitioners of "scientism", but its utility and worthiness may be disputed by those who see specialization as a mechanism that diverts men from involvement with social concerns and the well-being of their fellow man.

In summary: There appear to be at least seven potential disadvantages to specialization. They are:

1. The specialist is more prone to job obsolescence than generalists.
2. Specialists, with no room in their curricula for "extraneous" courses beyond their specialty, are deprived of knowledge enabling them to integrate with society and culture at large.
3. Specialists overrate the importance of their own field and are encouraged (by personal history) to oversell their skills.
4. Specialists develop reactionary and status quo attitudes towards social, economic, and political problems.
5. Specialists do not function well in hierarchical chains of command.
6. Specialists deal in narrow interest areas, leaving important broad policy positions open to less competent people.
7. Specialization encourages compartmentalized thinking (more specialization) rather than discovery.

A CASE FOR GENERALISTS

Thus far, we have been concerned with the specialist in our society. We will now investigate the role of the generalist. We have seen that society has been distinctly favorable to the specialists; so much so that Kaufmann (1971, p.21) remarks, "...both the educational system and the incentive structure in the United States have done their best to make the generalist an extinct species." In spite of this, there are at least three examples that suggest the generalist has done at least as well in our society as the specialist.

Arnstein (1964) seems to be impressed with the longevity of skills and attitudes characteristic of general education. His work on a national study of appropriate educational responses to automation and cybernetics gives him some credibility for such an observation. His statements indicate that the generalist may be better suited to society than the specialist.

Henry Winthrop (1966) builds a case for the credibility of an individual who receives a Ph.D. in one area, but who chooses to do scholarly work in a second area. Winthrop points out that the individual need not master all of the content (become a specialist) in the second area; rather, he selectively studies only that information of interest to him and pertinent to the problem he addresses. To buttress his claim, Winthrop composed a chart of leading scholars who have made major contributions outside the areas of their formal training. That chart is reproduced as Figure 2. Kaufmann (1971), who states "...the greatest contributions in any field were hardly ever made by specialists...", would probably endorse Winthrop's findings.

Insert fig. 2 about here

A third example that suggests the generalist is a success in our society in spite of the "veneration" the specialist enjoys, resides in the person of R. Buckminster Fuller. Fuller (1969) states that he set out to be a generalist fully realizing that this was an age of specialization, and expresses doubts that he would ever have become well known as a specialist. Fuller's work contains frequent references to the specialist and generalist, and he appears to heartily endorse the philosophy of generalism -- or, as he might say, comprehensiveness.

Having examined instances in which generalists can in fact exist profitably in our society, it now seems appropriate to investigate factors demonstrating society's need for generalists. Earlier in this paper we identified as a major weakness of specialization the inability of specialists to integrate and communicate with society at large and with each other. We will see that the integration and communication function is essentially the raison d'tre for generalists. One writer (Gregory, 1960) even

TABLE I

LEADING SCHOLARS WHO HAVE MADE MAJOR CONTRIBUTIONS OUTSIDE THE AREAS OF THEIR FORMAL TRAINING

Scholar	Area of Formal Training Or Professional Experience*	Areas of Major Contribution†
(1)	(2)	(3)
HANNAH ARENDT	Greek, philosophy, theology	History, the humanities, political philosophy, political science, social philosophy
KENNETH BOULDING	Economics	Conflict theory, eiconics,‡ general systems theory
JACOB BRONOWSKI	Mathematics	Economics, literature, philosophy
HENRY CHAPIN	History	Oceanography
COLIN CHERRY	Engineering	Interdisciplinary work§
P. E. CLEATOR	Space science and technology*	Archaeology, linguistics
E. J. DIJKSTERHUIS	Mathematics, physics	History of science and technology
R. V. FORBES	Chemical engineering	Archaeology, the history of science and technology
PATRICK GEDDES	Biology, with emphasis on botany	City planning, education, sociology, general interdisciplinary activity
SEBASTIAN DE GRAZIA	Philosophy, political science	Psychotherapy, social philosophy, sociology
GEORGE GROTE	Banking*	History of Greece
ALFRED KUHN	Economics	Interdisciplinary work‖
DAVID C. MCCLELLAND	Psychology	Economics, the social sciences
C. W. MAREK	Journalism, publishing*	Archaeology, cultural history
RICHARD MEIER	Organic chemistry, economics	Demography, science, economic development, general interdisciplinary work#
OMAR KHAYYAM MOORE	Sociology	Learning theory in psychology, novel techniques of educational programing
LEWIS MUMFORD	Literature, journalism*	Architecture, art history, education, history of science, sociology, town planning
JAMES R. NEWMAN	Law, political science	Educational work and writing on atomic energy control, general science, history of science, mathematics
JOHN VON NEUMANN	Mathematics, chemistry	Interdisciplinary: almost all of the natural and social sciences**
VILFREDO PARETO	Engineering	Economics, sociology and general historical and philosophical studies
MICHAEL POLANYI	Physical chemistry	Economics, philosophy, social studies
DAVID RIESMAN	Law	Sociology, general contributions to social philosophy and social sciences
NICOLAS RASHEVSKY††	Mathematics	Interdisciplinary: almost all fields in the natural and social sciences
HERBERT A. SIMON	Political science	Interdisciplinary work‡‡
PATRICK SUPPES	Philosophy	Mathematics and experimental decision theory
PIERRE TEILHARD DE CHARDIN	Geology, paleontology, theology	Cultural and scientific philosophy of an interdisciplinary nature

*An item marked with an asterisk in this column refers to an area of professional experience. Unmarked entries are areas of formal training.

†The separate listing of areas in which an individual has made a major contribution does not imply that he has failed to contribute in the area in which he was originally trained.

‡Boulding used this term to christen what he believed constituted a new science: namely, the images or symbol-laden theoretical frameworks which regulate men's perception of the world, particularly in the sciences and in the interpretation of their experience. See *The Image* (Ann Arbor, Michigan: University of Michigan Press, 1956).

§Cherry's interdisciplinary work reflects activity in communication theory, cybernetics, electrical telecommunication, experimental psychology, information theory, linguistics, mathematics, phonetics, semantics.

‖See his *The Study of Society: A Unified Approach* (Homewood, Illinois: Irwin-Dorsey, 1963), which draws upon the following fields: behavioral science, culture, communications theory, cybernetics, decision theory, information theory, organization theory, personality, psycho-linguistics, psychology, sociology, and systems research.

#The fields which Meier has drawn upon, and contributed to, include others besides these.

**Von Neumann is recognized as having made major contributions to almost every field in which he has worked.

††The description given for Rashevsky will also hold for many members, past and present, of the Chicago School of Biophysics.

‡‡Specifically, Simon has made contributions to the behavioral, social, and management sciences and to the new interdisciplinary areas, like simulation theory and cybernetics.

FIGURE 2

(adapted from Henry Winthrop)

Henry Winthrop (1966) builds a case for the credibility of an individual who receives a Ph.D. in one area, but who chooses to do scholarly work in a second area. Winthrop points out that the individual need not master all of the content (become a specialist) in the second area; rather, he selectively studies only that information of interest to him and pertinent to the problem he addresses. To buttress his claim, Winthrop composed a chart of leading scholars who have made major contributions outside the areas of their formal training. That chart is reproduced as Figure 2. Kaufmann (1971), who states "...the greatest contributions in any field were hardly ever made by specialists...", would probably endorse Winthrop's findings.

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Having examined instances in which generalists can in fact exist profitably in our society, it now seems appropriate to investigate factors demonstrating society's need for generalists. Earlier in this paper we identified as a major weakness of specialization the inability of specialists to integrate and communicate with society at large and with each other. We will see that the integration and communication function is essentially the raison d'tre for generalists. One writer (Gregory, 1960) even

calls for the "specialization of generalization" to overcome this very problem. From each of the factors that demonstrate society's need for generalists, this basic function can be derived. In our discussion of these factors, it will become clear that each of them reflect the need for integration and communication, it will also become evident that they represent a relatively recent development and a continuing trend.

A recent development in the business world has been the movement toward diversification. This has some implications for the need for generalists (Fuller, 1969). Prior to the trend toward diversification, the rule was for corporations to specialize in one product. In those days, the automobile manufacturers probably felt that interest in oil companies or lobbying for highways was not within their realm of influence. At the helm of the specialized corporations were specialized people. The trend toward diversification has set up a new demand. Representing a broader field of responsibility, the top managerial positions could no longer be adequately filled by a specialist with little talent for processing diverse information. The concept of manager as generalist became respectable. In fact, the manager of today is so much a generalist, that we frequently read accounts of "executive piracy" in which corporations hire top executives from other corporations that were oriented toward an entirely different product and perhaps, toward an entirely different industry. It may be that the specialists in management represent the first "specialized generalists."

Another trend that seems to support the need for generalists has been the move from a manufacturing economy to a service-oriented economy. This move has meant that the production sector of the economy must be more concious of various cultures within the society. The financial system exhibits a growing awareness of social and psychological pressures and of cultural factors. This awareness is exhibited in mutual funds that refuse to invest in munitions, or in tobacco, and by those that invest largely in

integrated housing and other socially beneficial projects (Fuller, 1967). In order that the various sectors of the economy can make appropriate responses to social/cultural forces, they require men with the kind of wide knowledge characteristic of generalists.

A third trend that indicates the importance of generalists in our society is the increasing politization of various sectors of the society, notably industry. Corporations are becoming more and more aware of their image, and make every attempt to cater to the public. Thus we see Humble expressing concern in television for the environment, and we are told the Xerox grants their employees the opportunity to take a sabbatical leave to perform socially valuable services for the community. Fuller identified such public, political areas as requiring the greatest amounts of integration of knowledge, and we infer that these areas are most in need of the generalists' talents. Paul Appleby (1949) even equated "generalist" with "political" and suggested that public involvement requires generalists. Kaufmann (1969) speaks of the importance of the generalists' knowledge of "political feasibility" and points out that specialists lack appreciation of political realities.

A surprising development which heralds the need for re-emphasizing the role of generalists is the claim by some that the information explosion makes specialization futile. This sort of reverse twist on the argument for specialization is meant to stress the point that what specialists learn today many have to be unlearned tomorrow. Knowledge is not only being generated faster than ever, it is also becoming obsolete faster than ever, e.g., our knowledge of the atom is continually revised (Burns & Brooks, 1970). Such "transience" of ideas requires a person who does not depend on a repetoire of discrete bits of information. The person best suited to cope with knowledge obsolescence should possess the ability to learn independently beyond formal school situations, and be able to process a wide range of knowledge, knowing those basic knowledges with wide transfer value. These are the attributes of a generalist.

A fifth development strengthening the need for generalists is the increasing use of the computer. Computer experts have said that the computer is clearly making man obsolete as a differentiator or specialist (Fuller, 1969). However, the computer is unlikely to ever -- at least not for a very long time -- replace man as an integrator. The computer seems to be a tool that is forcing man back to generalization.

The increasing role of the federal government in higher education and in the social sciences can be viewed as a sixth factor accentuating the value of generalists in our society.

Our nation's recent history has made it clear that national priorities have been focused on weaponry, space efforts and others requiring tremendous amounts of esoteric technical knowledge. It now appears that not all of our priorities will continue to require the massive inputs from the "hard" sciences (Chamberlain, 1970). In fact, we have some evidence that increasingly the nation's priorities focus around such issues as reduction of poverty and equal opportunities for health and education (Rivlin, 1971; Allen, 1971). We have already discussed the value of the generalists in roles involving both the public and government. Programs of national scope will require broad, intense knowledge that the specialist does not characteristically possess.

A final trend that points to the need for generalists is related to what Toffler (1970) describes as "transience." We discussed the effect of idea transience above. We should also consider the transience of organizational forms. Toffler points out that man's organizational relationships change with increasing rapidity, and that management is becoming increasingly project oriented. Whole organizations from for a particular project and disband upon the project's completion. Toffler calls such transient organizations "ad-hocracies" and says the educational system, with its orientation toward the production of specialists, is not producing individuals who can

function optimally in these ad-hocracies. The need is for an adaptive, versatile person we describe as a generalist.

We have just examined seven factors that might be regarded as indicators of society's need for generalists. To briefly summarize these factors:

1. The movement of corporations toward diversification.
2. The response of the economy to social/cultural forces with increased emphasis on services rather than goods.
3. The politization of industry.
4. The information explosion and transience of ideas.
5. The computer.
6. The increasing role of the federal government in education and the social sciences.
7. The growth of "ad-hocracies."

THE CASE AGAINST GENERALIZATION

Having discussed the disadvantages of specialization, it is only fair to do the same for generalists. However, in the literature investigated for this study, no direct statements were made describing weaknesses of generalization, although certainly all the arguments for specialization imply weaknesses of generalists.

The lack of direct statements concerning weaknesses of generalization may be due to the belief that the generalist is indeed the person required to meet the demands of the day. But it does seem, at least to this writer, that there is one danger to be avoided in our push toward training generalists and toward generalization. The problem lies not so much with the <u>concept</u> of generalists in the society as with the improper <u>training</u> of generalists.

The danger is that the generalist will become the epitome of the proverbial "Jack-of-all-trades." He may study too broadly and too shallowly to meet the criteria for a

true generalist. A superficial knowledge of several fields is not enough; recall that in our definition, we referred to intense study. It's relatively easy to gain a smattering of knowledge about a lot of things and quite another matter to gain profound knowledge of those things. The difference between a true generalist and a superficial generalist is a matter of degree, and it is doubtful that this degree can be satisfactorily defined.

It appears to this writer that the generalists can delude themselves about their knowledge and importance just as easily as the specialists delude themselves. We should be alert to the sham generalist and learn how to avoid the folly of encouraging broad study without intense learning.

A SUMMARY THUS FAR

Before continuing, it seems advisable to examine our findings to this point. We have briefly described the historical development and meaning of the terms generalist and specialist, we have noted the importance of the specialist to society, we have examined some potential disadvantages of specialization, we have discussed the case for generalists in our society, and we have discussed a potential danger of emphasizing generalization. In reviewing what we have said, it might appear that this paper is biased in favor of the generalist. This is not intended to be the case. The findings merely (and, I think, fairly) reflect the literature that addresses the issue.

The dominant attitude does seem to favor generalists. I think the reason for this can be explained. Because of the premium that has been placed on specialization, society has tended to relegate generalization to a poor second place. This process has been bolstered by "...specialized experts who dominate institutes of learning and research and exert influence in an advisory capacity...to discourage generalism and mistrust generalists" (Kaufmann, 1969, p.21). We have been witness -- particularly

during the turbulent '60's -- to many instances in which the "oppressed" minority strikes out against the will of the majority. It seems to be some unwritten law that those who are the unhappiest with the system make the most noise, be they "hippies", blacks, environmentalists, or anti-war groups. It may be that those who feel our current emulation of specialized experts is wrong are following that "law." If such is the case, we need to examine closely the possibility that they do present biased points of view and are not representative of the best thinking about the issue.

A careful review of the literature presents us, not with a dilemma as we might suppose, but with clear, logical statements asking us to reconsider our emphasis on specialization. It requires that we not consign specialists to a lowly role, but place generalists in a proper perspective. It indicates that we must not abolish specialists either. In fact, most writers are saying that although generalists are increasing in importance, we should not do a complete turn-about and denigrate the specialists. Both are necessary.

In summary, specialists are important to society. There is so much to know that some people must specialize. At the same time, society has given short shrift to the generalist. The prevailing thought in the literature today is that the generalist is exceedingly important to our society, and is perhaps more important than the specialist. The advice seems to be that we should tap our best students for generalized studies in order that the vast task of integration and communication can be done by our ablest citizens.

Two tasks remain before us. First, we must consider the needs of our own field. What kind of students are needed for educational technology to meet the challenges of education? Second, how can we best meet these needs?

THE NEEDS OF EDUCATIONAL TECHNOLOGY

In examining the needs of educational technology we are faced with an immediate problem based on the fact that professionals in the field have never been able to agree on its definition, or even its title. It is not the intent of this writer to define or label the field beyond what I've already done. In order to pursue the purpose of determining the kind of people educational technology needs, I will first attempt to identify some characteristic activities performed by educational technologists. If these can be agreed on, it seems that we can then address the question of what kinds of people -- specialists or generalists -- are most needed in the field.

One of the obvious activities educational technologists engage in is the development of instructional system components, those "...components of an instructional system which ...[can]...be combined in various ways in order to bring about learning" (Silber, 1971). Instructional material centers and curriculum development centers represent some of the settings for the developmental process. The Center for Instructional Development at Syracuse University is an example of such a center. In such centers, the educational technologist produces materials and systems that provide faculty with aides for the instructional process.

Another activity of educational technologists is the management of various types of media or curricular development centers. These educational technologists meet with various publics involved in instruction, while at the same time managing what may be a multi-million dollar complex, with twenty to thirty employees.

Educational technologists also consult, usually concerning instructional design or management. They teach courses in programmed instruction, computer techniques, management, production, design, instructional techniques, systems design, learning theory and more. They do experimental research on media use and on learning environ-

ments. They do many other things, but this brief list, if characteristic of things educational technologists do, is adequate for our purposes.

The educational technologist performs a wide variety of relatively sophisticated tasks, as indicated above. It appears that our earlier observation of a need for specialists in educational technology is supported by this inventory of functions.

Another thing that becomes evident from the list is that the educational technologist interacts with a broad public. The IMC manager, the consultant, the instructor, the instructional developer, all meet with a wide variety of professionals and students. Admittedly, this wide variety of people is of a considerably more restricted range than we have thus far considered. In the open society, the "sky's the limit" as far as the range of people encountered in daily life is concerned. Nevertheless, individual differences are probably as great in the educational community as they are in the engineering profession, the construction industry, the medical profession, the business world, or the political sphere. I believe we could agree that there are "as many" oddballs, nice guys, extremists, and apathetic people in education as in those fields just listed. I believe the arguments cited in defense of the generalists for society's needs are just as valid when applied to educational technology. Many educational technologists find they must perform an integrative function for their broad publics. One of the most striking "proofs" of this, I encountered at the 1971 AERA annual meeting in New York City. In their list of jobs available, one job stood out from the rest. An instructional developer was wanted for a mid-western college. The salary was listed as $20,000. Some requirements were listed, but nothing was said about years of experience or about the degree held. The primary requirement was that this person be able to communicate with "liberal arts types." It seems that there <u>is</u> a need for generalists in educational technology.

So it appears that both specialists and generalists are needed in the field of educational technology. Furthermore, it appears that we have both specialists and generalists. However, as stated in the introduction to this paper, the production of generalists in educational technology is almost happenstance. How can we best develop generalists for educational technology? We will not discuss how to produce a specialist; we assume that is being adequately handled. Neither will we address the question of the proportion of generalists to specialists; that is beyond the scope of this paper, although it is a question that deserves investigation.

DEVELOPING A GENERALIST

The primary step that must be taken in order to develop generalists for instructional technology is to admit that they are as important, if not more so, than specialists. The shroud of irrespectibility that has long enveloped generalization should be lifted. The advantages of generalization should be made known. This department should take the lead in that respect.

A second step is one that a number of people have said our department does already. That is the selection of competent, high caliber students. It has been pointed out that the best, not the poorest, students should be counseled to pursue the goal of becoming a generalist. Only the best people can cope with novel environments, spot subtle relationships and make the critical judgements required of a person who may one day find himself "dealing a heavy hand" in curriculum areas of an entire university.

A third step would be to stress the point that educational technology doesn't have to be merely content, but is also concerned with process and, as such, involves numerous publics. The fact that educational technology is ultimately concerned with people learning should be emphasized; and the relation of educational technology with the composite social rubric should be kept in view.

Fourthly, the department should encourage students to pursue their own interests and design their own program of study. To assist students in selection of courses outside the department, the faculty should attempt to identify courses elsewhere in the university that confront pressing probelms of our time, courses that relate content to social needs. Furthermore, an attempt should be made to relate our own courses to current social and educational needs.

Finally, the department might consider radical departures from the 90 hour doctorate. The dissertation could become an account of the student's social contribution such as establishing instructional development in a ghetto school or in a "free" school. As a demonstration of competency, it would seem just as valid as a "typical" research oriented dissertation. High standards could be established and agreed upon just as much for one form of dissertation as for the other.

The above suggestions are, of course, easier to name than to describe in detail. How does one relate a course to living? One possible, and not so facetious, answer is with a great deal of time and effort. Shifting the emphasis from developing specialists to developing generalists requires a new frame of reference. The important thing at this time is that we shake off the notion that being a generalist is somehow inferior, and press for the acceptance of the generalist's skills as being suitable for our best scholars. Our next step should be to operationalize an approach to producing those generalists.

In closing, it seems fitting to quote Henry Winthrop (1966):

> "...[Higher education's] major current responsibility...is the revision of the college and the university curriculum in the light of a new philosophy of education which recognizes that, given the social complexities of our time, intellectual growth and the understanding of community require a continued interdisciplinary approach. Until the need for interdisciplinary perspective is more fully and cogently reflected in the modern curriculum, we shall continue to have artificial and irrelevant controversies surrounding the roles of generalists and specialists, with all the unnecessary misunderstanding, lack of communication, and loss of time which they produce." (p.201).

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