Natural Learning in Higher Education

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Synonyms

Learning as natural process, Non-Coercive Higher Education

Definition

Theoretical Background

Parents do not send their children to school to learn how to speak. How then do children learn to speak? The *objective* becomes obvious to children due to the frustration of being unable to communicate. L*earning tasks* allow for practice. *Feedback* is immediate and clear because adults love to help young learners. A*pplications* of new knowledge are made so as to continue learning. Children take responsibility for all aspects of this "natural learning process." Natural learning obviously works.

Adults often use the natural learning process when they need to learn something that is important to them (Tough 1971). For example, people have taught themselves to speak a new language, use computers, learn math, play chess, or to play a musical instrument. They set objectives and manage this process by seeking resources and help from others, engaging in active learning tasks, getting feedback from others, and practicing applications. The motivation is intrinsic. Natural learning obviously works.

This chapter contrasts natural learning with teacher-responsible learning by focusing on experimental evidence.

Traditional approach to education: Teacher responsibility

Under the approach used at the vast majority of universities, the teacher (or committees of teachers and administrators) are expected to decide what learning objectives are best for students, what learning tasks must be done and when, and what feedback students should be provided with.

Unfortunately objectives are seldom made explicit in university, tasks are often of little interest to students, feedback focuses on content (facts) rather than skills, and application is seldom addressed. Motivation is based on extrinsic rewards and punishments in a competitive environment (Kohn 1986).

The underlying message at universities is that learners are not responsible for their learning. This message from the education industry starts long before the university. Using a sample of 506 males (median age 10.5 years), half were randomly assigned to a five-year program that included tutoring in

academic subjects and counseling, while the other half (the control group) received no services. In a 30-year follow-up, those from the treatment group were highly positive about the value of the program. But compared to the control group, they were more likely to have committed a crime, been alcoholic, died younger, been in occupations with lower prestige, and report that their work was not satisfying (McCord 1977). Might the teacher-centered approach foster a sense of helplessness about learning?

The next few paragraphs discuss ways in which traditional education ignores or suppresses learner responsibility.

Content and delivery

Learning involves change. However, people often resist information that conflicts with their current beliefs, especially when a message is from a trusted source and when the evidence is strong (Batson 1975). On this point, consider how you feel as you read this paper. It is an important issue and the paper will challenge your beliefs with experimental evidence that you have never seen before.[1] What is the likelihood that you will use this information? And what information would be required to convince you that the teacher-responsible approach is harmful?

For reasons that will be discussed below, schools focus on transmitting content that does not challenge beliefs. For example, much of what is taught at business schools reinforces common practices. An examination of a sample of textbooks on principles of marketing found no use of evidence-based findings; and when "principles" were provided, experts rated conflicting principles to be just as sensible as the advice in the textbooks (Armstrong and Schultz 1993).

In some fields, such as management education, students who lack vital skills become upset when this is made apparent. It is difficult to find evidence showing that students who graduate from business schools have improved skills in areas such as planning, gaining cooperation, conducting meetings, writing business reports, listening, or analyzing data.

Teachers' widespread use of in-class transmission of content via multimedia tends to restrict university learning to simple content because it is difficult to learn complex material with multi-media (Furnham, Gunter & Green 1990).

Finally, much of the material that is taught in universities has no value in the real world. The material that is taught in some fields is often unsupported, incorrect, or harmful (see Armstrong, 1996, for examples from business education). For example, academics who specialized in consumer behavior were less successful at predicting the outcomes of studies conducted by consumer behavior researchers than were high-school students who had no formal education on the topic. The result occurred despite all of the studies having been published in the leading journal in the field, the *Journal of Consumer Research* (Armstrong 1991).

Grading of students by teachers

In addition to helping students learn, teachers assess their learning. The evaluation role tends to dominate the helping role; for example, students focus on their grades and do not seek substantive feedback. This role conflict explains why faculty and students at universities sometimes view the other party as the enemy (Armstrong 1995).

Deci, Koestner and Ryan's (1999) meta-analysis of 128 studies found that people who expect to receive extrinsic rewards (or punishments) become less interested in the task itself. They concluded that such rewards "undermine people's taking responsibility for motivating or regulating themselves." In his review of the evidence on learning, Condry (1977) had reached the same conclusion. Further evidence is provided by Kohn (1993).

[1] To ensure proper summaries of the research studies, the summaries were sent to authors that were cited in a substantive way. Almost all responded and they provided useful corrections and suggestions about additional research.

Student evaluations of teachers (SET)

Nearly all universities use student evaluations of teachers (SETs). For example, they are used by over 99% of business schools (Clayson 2009). It is assumed that students understand how they learn, that the feedback will help to select those teachers best able to help students, that happy students are good learners, and that the feedback will lead teachers to improve. It is difficult to find evidence to support any of these assumptions. Given that students have little knowledge of the material or of how people learn, one might question why SETs would be of any value.

Experimental studies found that when people know that they will be rating the satisfaction of the services they receive, they become more critical and are less satisfied than those who receive the same services without expecting to report on their satisfaction (Ofir and Simonson 2001).[2]

SETs are likely to affect content. Because students become upset when presented with evidence that challenges their beliefs, SET scores can be improved by reinforcing what people already believe. And to ensure that all students can understand the content, teachers could use materials designed for the slowest learners.

Extensive research has shown that there is little relationship between SETs and learning (see the meta-analysis by Clayson 2010). For example, in a well-controlled, large-scale (2,820 courses taught by 421 faculty members) ten-year experiment involving random assignment of students to teachers in calculus courses, students in classes where the teachers had lower SETs performed better in subsequent classes (Carrell and West 2010). [3]

SETs are regarded by many teachers as demeaning (Gray & Bergmann 2003); the underlying message is that teachers do not understand the material or how to deliver it while the students do know these things. Not surprisingly, then, feedback from SETs has no obvious benefits for teachers. Carrell and West (2010), in the above-mentioned experiments, found that more experienced professors with higher rank and higher degrees received substantially lower SETs, although their students did better in later courses.

Most importantly, student ratings of teachers serve as a signal to students that they are not responsible for their learning. They can blame their failures on the teachers' inability to motivate or instruct them.

Learning in groups

People placed in groups (e.g., in classrooms or study groups) typically lose a sense of responsibility. When adults were asked to describe what important things they learned and how they learned them, they typically mentioned things for which they had taken individual responsibility. They seldom mentioned learning in groups, especially in groups with leaders (Tough 1982).

The loss of individual responsibility occurs even for very small groups, such as a group of two. Thus, assessments of class size have found little benefit to learning from reducing class size (Hanushek 2003).

Learning is especially likely to be suppressed when people are in groups with capable people because, following the free-rider effect, they allow the skilled people to do the work (see the meta-analysis by Karau and Williams 1993). Also, whereas task-related diversity improves group creativity and productivity, bio-demographic diversity does not; in fact, a meta-analysis by Horwitz and Horwitz (2007) found negative effects.

Evidence on the value of the teacher-responsible approach at universities

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[2] Paradoxically, then, schools that would like to improve student satisfaction would be advised to avoid use of SETs.

[3] Schools intent on increasing SETs should consider using part-time practitioners to do the teaching.

Non-experimental analyses routinely show that more highly educated individuals are more successful. This does not mean that education has an effect. First, cognitive ability is the most important criterion for most highly paid jobs, and schools admit students with good cognitive ability. Second, many organizations screen out job applicants who lack educational credentials.

Student responses

The effectiveness of the traditional system has been questioned in many ways. Here is a brief overview of evidence on how students respond to teacher-responsible education.

Students invest little time on learning: In 1961, university students spent about 40 hours per week on class and study time, a rate that had held since the 1920s. This dropped steadily since that time, to 27 hours per week by 2003 (Babcock and Marks 2010). The decrease is especially pronounced for individual study time; between the 1960s and 2000s, study time decreased by half, to about 14 hours (Babcock 2010). Of this, a large and apparently increasing proportion of time is spent in groups. Thus, little time is now spent on individual learning. In contrast, adults who are not students spend about 14 hours per week of their time in their learning projects (Tough 1971). A whole industry has developed to help students avoid effort in obtaining their degrees.

Students' interest is low during classes: On days they are not sick, many arrive unprepared and late, come and go during class, and use their computers and phones for unrelated tasks during class. An anti-intellectual class atmosphere has evolved in some schools, such as in business schools (see the role as reported by an MBA student in Robinson 1994).

Resistance to learning is high: Two pre-and-post-test studies examined what happens in psychology courses when students were presented with evidence-based findings that conflict with their current beliefs. Changes in beliefs occurred for only 6% of the items in each of the two studies (Vaughan 1977). Students who have been exposed to the well-established evidence on how to sent select job applicants fail to use this knowledge on the job as it conflicts with their beliefs (Ahlburg 1992). Similar results were obtained in economics, where evidence-based findings typically conflict with "common sense." Attiyeh and Lumsden (1972), in a study of 30,000 students in economics courses in the U.K., found that attendance was not related to learning as measured by "before" and "after" examinations.

Ethical standards toward learning are low: A large-scale survey in 1963 found self-reported cheating by 82% of university students, and a similar survey in 1993 reported 84% cheating. Interestingly, when responsibility was transferred from teachers to individual students via honor codes, cheating was much lower (McCabe and Trevino 1996).

Outputs

Many studies have examined the benefits of a university education. Here is a sample:

Grades vs. job performance: Grades at universities have a low relationship to long-term job performance ($r = .05$ for 6 or more years after graduation) despite the fact that cognitive skills are highly related to job performance (Roth, et al. 1996). In addition, they found that this relationship between grades and job performance has been lower for the more recent studies.

Value of specialized academic training: Among marketing professionals, those who had taken university marketing courses did no better in their careers than those who had not (Hunt, Chonko & Wood 1986).

For workers with the same jobs (e.g., air traffic controllers), those with more education were less effective than those with less education (Berg 1970).

Job performance by quality of university: Even the best universities cannot ensure learning. Krueger and Dale (2002) examined this by looking at students who were accepted by two universities of different levels of prestige (e.g., the University of Pennsylvania and Penn State) and comparing those who chose the more prestigious school with those who chose the less prestigious. For the 1,330 students in these matched samples, there were no important differences in career outcomes when assessed 15 years after graduation.

Effects of formal education on economic growth: Educational credits provide economic benefits to individuals. Does this translate to benefits for the common good?

Given the lack of evidence showing that formal education is effective, prejudicial hiring of people based on education, and the immense costs involved with education, one might expect a negative return to society for educational expenditures. To examine this, it is necessary to control for differences among individuals. This can be done by analyzing longitudinal data by country. Wolf (2004) summarized such studies; these correlated countries' expenditures on education (up to 91 countries in one study) with their economic growth over a given time period. These natural experiments, in the sense that governments impose different strategies, found that increases in educational expenditures were detrimental to the economic growth of nations.

Important Scientific Research and Open Questions

Natural learning for universities

If learners are the producers of learning, the teacher-responsibility inhibits learning. Efforts to improve the teacher-centered approach reduce learner responsibility. The solution is straightforward: Allow people to take responsibility for their learning. Here are some suggestions for using natural learning in universities.

Setting objectives

Success on nearly any task depends on having clear and well-stated objectives (Locke & Latham, 2002). Students are typically unaware of how to set objectives, and they are seldom asked to set objectives; therefore it is doubtful that many of them set objectives. Coaches could assist students in formulating useful learning objectives.

Objectives change over time. Thus, rather than spending four years educating people for life, it would seem more useful to tailor the education to take place as new learning objectives arise during their careers – and also sothat they can benefit from the most recent knowledge.

The Internet allows for learning to be directed at one's current objectives. Consider the progress in the medical field where sites such as Cochrane.org or webmd.com allow patients as well as doctors to diagnose problems. This has also been done in education (campbellcollaboration.org), forecasting (forprin.com), and advertising (adprin.com). Another advantage of this just-in-time learning is that it overcomes the fact that people forget much of what they learn over months, not to mention over years (e.g., Bacon and Stewart, 2006, found that half of the knowledge from a course on consumer behavior was lost in 13 weeks).

Engaging in active and useful learning tasks

Students should be encouraged to do independent work. Faculty members should develop learning materials for students that would be suitable for self-study. Students could use discussions, videos, and books. However, for more effective learning, students should engage in active tasks such as writing papers, problem-based projects, and experiential exercises (e.g., role-playing). Students would be free to

choose tasks they think would help them to best meet their objective and they should focus on applying what they learned.

Universities have a comparative advantage in the area of doing research and in communicating the findings. Thus, they could develop tasks designed around useful evidence-based findings as done in some medical schools.

Obtaining relevant feedback

Students should be encouraged to keep learning diaries and to provide periodic (e.g., weekly) assessments in which they describe their progress on the plan, as done for example, in Dalton Schools. This might culminate in a learning portfolio that they could post on the Internet to demonstrate what they have done and what they have learned.

Assessment centers would be used to provide feedback to students about their mastery of techniques and principles in given areas. Examples from the area of management include preparing and delivering a persuasive talk, analyzing evidence, conducting an interview, or running an effective problem-solving meeting. Students and coaches would share a common goal for the students' success on these independently administered assessments. In addition, critical incidents surveys could be used to evaluate what students were able to apply from courses they have taken.

Evaluations of the teachers and schools could be done by looking at the success of their students on assessment center tests and on evaluations of critical incidents surveys.

When prospective employers request information about learning, students could send portfolios and assessment-center scores.

Implications for universities

Natural learning methods could lead to substantial improvements in universities. Many PhD programs, company training courses, management training programs, and a few colleges have successfully used elements of natural learning.

Not all students would benefit from natural learning at universities. The recommendations here are aimed at students who have adequate ability for university education. Murray (2008) estimates this to be about 10% of the population. He suggests that the majority of students currently attending college do not have the ability to handle genuine college-level material. Furthermore, some students lack the self-discipline needed to engage in learning something that does not have an immediate payoff. Self-discipline, such as that measured by the "marshmallow test" (Mischel, Shoda & Rodriquez 1989) was found to be a better predictor of academic performance than IQ (Duckworth and Seligman 2005).

To compound the problem, "fairness" is often used at the expense of cognitive ability at elite universities. This is a controversial area, since what seems fair to some people may seem unfair to others.[4] As a matter of practice, admission to elite universities is heavily determined by skin color and religious beliefs. For example, to have the same opportunity for acceptance at America's elite colleges, Asians must score 450 points higher out of 1600 on the SAT tests than people with black skin. Upper-economic class applicants must pay more and score 160 points higher than lower-economic class applicants to have the same chance for admission (Espenshade and Radford 2009, p. 92).

In addition, a substantial proportion of those with the necessary ability have little interest in spending four years on something that is irrelevant to their ambitions. The net effect is that many students are labeled as "dropouts" by universities for an activity that is not suited to them nor is it of any

[4]. Here is one survey: "Do you think affirmative action programs that give preferences to blacks and other minorities in hiring, promotions and college admissions should be continued, or do you think these affirmative action programs should be abolished?" Continued 36% Abolished 55% Unsure 9%
Quinnipiac University Poll. May 26-June 1, 2009. N=3,097 registered voters nationwide.

demonstrable value to their skills. Is this a proper way to treat people who, as shown above, can learn effectively on their own?

Universities could deliver courses via the Internet with no need for certification. The Internet facilitates natural learning and can do so at a much lower cost than classroom teaching. In addition to overcoming the negative effects of groups, the Internet enables students to work on learning tasks when the need arises, to move at their own pace (there are enormous differences in the rates at which people learn and these vary by subject area), and to seek feedback relevant to their needs.

Would the learner-responsible approach make it more difficult for organizations hiring graduates from universities? As shown in Hunter and Hunter's (1984) meta-analysis of entry-level jobs, ability tests had much higher correlations with supervisors' performance ratings than did education. Thus, by using cognitive ability tests instead of education, organizations can make better hiring decisions.

The research suggests changes in the funding of higher education. The burden of proof should be on those who claim that the government knows better than people on how direct funds for learning. Given the evidence on harmful effects, governments should reduce investments in university education. Some industries go beyond ensuring that they cause little harm. For example, health care firms sometimes state that they only sell products or services that have been shown to be effective in scientific studies. Higher education has not provided such evidence over the centuries of its existence.

When adults and organizations have a need for education, they can invest as they see fit. Dr. Samuel Johnson reached this conclusion in 1775 when he said that universities prospered as a consequence of national wealth, and not the other way around. Consistent with this, Adam Smith opposed government funding of universities (Kealey 1996).

Conclusions

The traditional teacher-responsible design for education in universities conflicts with what we know about how people learn. In contrast to natural learning, it substitutes teacher for learner responsibility. As it is based on extrinsic rewards, it undermines intrinsic interest in learning. Attempts to improve upon this approach would be expected to further diminish student responsibility and make things worse. Not surprisingly, then, the evidence shows a sharp decline in the effectiveness of universities since 1960. In other words, when doing the wrong thing, doing it "better" makes things worse.

Adults know how to learn and they have known almost since birth. The call for natural learning wherein each person has control is consistent with evidence from other markets. Efforts to improve the efficiency of various outcomes by a third party's use of extrinsic rewards have been counterproductive in all markets studied to date (Winston 2006). Instead of allowing people to spend money to educate themselves – or their friends, family, and employees –governments tax people and decide who should be educated, about what, and how.[5] Organizations hire people for their certificates rather than for their ability to perform jobs.

To reap the benefits of the learner-responsible education, it is not necessary to adopt all of the action steps. Instead, small pilot programs should be encouraged by universities. These would be low-risk changes for prestigious universities because they admit only a small percentage of their applicants.[6]

[5] Some reviewers have suggested that this chapter ignores evidence for the "other side." When asked what experimental evidence they are referring to, they have had no response. Perhaps there is none?

[6] Natural learning might affect student satisfaction, but, Armstrong and Sperry (1994) found that student satisfaction had no measurable impact on the prestige of schools.

References

Ahlburg, Dennis A. (1992), Predicting the job performance of managers: What do the experts know? *International Journal of Forecasting* 7, 467-472

Armstrong, J. S. (1991), "Prediction of Consumer Behavior by Experts and Novices," *Journal of Consumer Research*, 18, 251-256.

Armstrong, J. S. (1995), "The devil's advocate responds to an MBA student's claim that research harms learning," *Journal of Marketing*, 59 (July), 101-106.

Armstrong, J. S. (1996), "Management Folklore and Management Science: On Portfolio Planning, Escalation Bias and Such," *Interfaces*, 26, No. 4, 28-42

Armstrong, J. S. (1998), "Are student ratings of instruction useful?" *American Psychologist*, 53, 1223-1224.

Armstrong, J. S. & R. Schultz (1993), "Principles involving marketing policies: An empirical assessment," *Marketing Letters*, 253-265.

Armstrong, J.S. & T. Sperry (1994) "Business school prestige: Research versus teaching," (with commentary) *Interfaces*, 24, 13-22.

Attiyeh, R. & K. G. Lumsden (1972), "Some modern myths in teaching economics: The U.K. experience," *American Economic Review*, 62, 429-433.

Babcock, Philip (2010), "Real costs of nominal grade inflation? New evidence from student course evaluations," *Economic Inquiry*, 48, 983-996.

Babcock, Philip S. & Mindy Marks (2010). "The falling cost of college: Evidence from half a century of time use data." Cambridge, MA: National Bureau of Economic Research, www.nber.org/papers/w15954.

Bacon, Donald R. and Kim A. Stewart (2006), "How fast do students forget what they learn in consumer behavior? A longitudinal study," *Journal of Marketing Education*, 28 (3), 181-192.

Batson, C. Daniel (1975), "Rational processing or rationalization? The effect of disconfirming evidence on a stated religious belief," *Journal of Personality and Social Psychology*, 32, (1), 176-184.

Berg, Ivar (1970), *Education and Jobs: The Great Training Robbery*. New York: Praeger, New York.

Carrell, Scott E. & J. E. West (2010), "Does professor quality matter? Evidence from random assignment of students to professors," *Journal of Political Economy*, 118 (3), 409-432.

Clayson, Dennis E. (2009), "Student evaluations of teaching: Are they related to what students learn? A meta-analysis and review of the literature," *Journal of Marketing Education*, 31 (1), 16-30.

Condry, John (1977), "Enemies of exploration: Self-initiated versus other-initiated learning," *Journal of Personality and Social Psychology*, 35, 459-477.

Dale, Stacy Berg and Alan B. Krueger (2002), "Estimating the payoff to attending a more selective college: An application of selection on observables and unobservables," *Quarterly Journal of Economics*, 107, 1491-1527

Deci, Edward L., R. Koestner & R. Ryan (1999), "A meta-analytic review of experiments examining the effects of extrinsic rewards on intrinsic motivation," *Psychological Bulletin*, 125, No. 6, 627-668 .

Duckworth, Angela. I. & Martin E. P. Seligman (2005), "Self-discipline outdoes IQ in predicting academic performance of adolescents," *Psychological Science*, 16, 939-944.

Espenshade, Thomas J. & Alexandria W. Radford (2009), *No Longer Separate, Not Yet Equal: Race and Class in Elite College Admission and Campus Life*. Princeton: Princeton University Press.

Furnham, Adrian, B. Gunter & A. Green (1990), "Remembering science: The recall of factual information as a function of the presentation mode," *Applied Cognitive Psychology*, 4 (3), 203-212.

Gray, M. & B. R. Bergmann (2003), "Student teaching evaluation: inaccurate, demeaning, misused," *Academe*, (September–October), 44–46.

Hanushek, Eric A. (1999), "Some findings from an independent investigation of the Tennessee STAR experiment and from other investigations of class size effects," *Educational Evaluation and Policy-analysis*, 21 (2), 143-163.

Horwitz, Sujin K. & I. B. Horwitz (2007), "The effects of team diversity on team outcomes: A meta-analytic review of team demography," *Journal of Management*, 33, 987-1015.

Hunt, S. D., L. B. Chonko & V. R. Wood (1986), "Marketing education and marketing success: Are they related?" *Journal of Marketing Education*, 6 (Summer), 2-13.

Hunter, John E. & R. F. Hunter (1984), "Validity and utility of alternative predictors of job performance," *Psychological Bulletin*, 96, 72-98.

Karau, Steven J. & K. D. Williams (1993), "Social loafing: A meta-analytic review and theoretical integration," *Journal of Personality and Social Psychology*, 65, 681-706.

Kealey, Terence (1996), *The Economic Laws of Scientific Research*. London: Macmillan.

Kohn, Alfie (1986), *No Contest: The case Against Competition.* New York: Houghton Mifflin.

Kohn, Alfie (1993), *Punished by Rewards.* New York: Houghton Mifflin.

Locke, Edwin A. & G. P. Latham, (2002) "Building a practically useful theory of goal setting and task motivation: A 35-year odyssey," *American Psychologist*, 57, 705-717.

McCabe, Donald L and Linda K. Trevino (1996), "What we know about cheating in college," *Change*, (January/February 1996), 29-33.

McCord, Joan (1978), "A thirty-year follow-up of treatment effects," *American Psychologist*, 33 (3) 284-290.

Mischel, W., Y. Shoda & M. L. Rodriquez (1989), "Delay of gratification in children," *Science* (244), 933-938.

Murray, Charles (2008), *Real Education*. New York: Crown Forum, an imprint of Random House.

Ofir, Chezy & Itamar Simonson (2001), "In search of negative customer feedback: The effect of expecting to evaluate on satisfaction evaluations," *Journal of Marketing Research*, 38, 170-182.

Robinson, Peter (1994), *Snapshots from Hell*, New York: Warner Books.

Roth, Philip L.C. A. Bevier, F. S. Switzer & J. S. Schippmann (1996), "Meta-analyzing the relationship between grades and job performance," *Journal of Applied Psychology*, 81, 548-556.

Tough, Allen (1971), *The Adult's Learning Projects*. Toronto: Ontario Institute for Studies in Education.

Tough, Allen (1982), *Intentional Changes*. Chicago: Follett Publication.

Vaughan, Eva D. (1977), "Misperceptions about psychology among psychology students," *Teaching of Psychology*, 4 (3), 138-141.

Winston, Clifford (2006), *Government Failure versus Market Failure*. Brookings Institution Press.

Wolf, Alison (2004), "Education and economic performance: Simplistic theories and their policy consequences," *Oxford Review of Economic Policy*, 20, 315-333.

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