

**Notes from: Disrupting Class: How Disruptive Innovation will Change the Way the World Learns
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Introduction

Four high hopes for our schools

1. Maximize human potential
2. Facilitate a participative democracy
3. Hone skills that will help keep our economy remain prosperous and competitive.
4. Nurture the understanding that people see things differently and respect those differences.

Why do schools struggle to improve? Theories include:

- Schools are underfunded
- Not enough computers in the classroom
- Blame the students and parents-they are uninterested and nonsupportive
- U.S. teaching model is broken compared to other countries
- Teacher unions
- The way we measure schools' performance is fundamentally flawed

The real cause: Motivation

- Extrinsic Motivation-comes from outside the task(learning will have an end goal)
 - Makes the school's job easier-students want to learn due to an outside pressure
 - Reason for extrinsic motivation: prosperity
Example: Japan's rise to manufacturing power in the '70's and '80's
 - Japan had 4x number of students studying math, science and engineering
 - When they reached economic prosperity, the number of above students decline
 - After WWII, Japan was extrinsically motivated, once they reached prosperity, they lost that motivation

Reason for a lack of extrinsic motivation: family and cultural background

- Intrinsic Motivation-comes from the task being stimulating, fun and enjoyable
 - When there is not extrinsic motivation-schools need to create intrinsic motivation

Chapter 1 Why Schools Struggle to Teach Differently When Each Student Learns Differently

Every person learns differently and not all students can learn if they are taught in the same way.

Harvard psychologist Howard Gardner defines intelligence as:

- The ability to solve problems that one encounters in real life
- The ability to generate new problems to solve
- The ability to make something or offer a service that is valued within one's culture

Gardner developed the idea of multiple intelligences

1. Linguistic
2. Logical-mathematical
3. Spatial
4. Bodily-kinesthetic
5. Musical
6. Interpersonal
7. Intrapersonal
8. Naturalist

Most people excel in only two or three of the eight intelligences

Within each type of intelligence, there are different learning styles (visual, talk, write, play, etc.)

Within each type of learning style, there are different paces (slow, medium, fast)

Interdependence and Modularity

Modularity in industry means that anyone can create the parts and will fit or work

Ex. Light bulb interface for the socket-threaded part (bulbs can be different)

Dell computers-built customized computers for consumers, no parts made by Dell

Interdependence in industry means every part depends on how the other parts are made.

Example: Apple computers when they were first starting-all made by Apple for Apple

This made it expensive for Apple to customize

The Schooling Dilemma: Standardizing Teaching Versus Customizing Learning

Today's school model is interdependent with four types of interdependencies:

1. Temporal-must have studied a subject in an earlier grade before studying more in a higher grade

2. Lateral-methods must remain the same (teaching Spanish and English)
3. Physical-building structure, doesn't allow for customized learning
4. Hierarchical-Mandates from federal, state and local agencies make it hard to find modularity

These interdependencies make it difficult for the schools to become modular (standardized) which allows the schools to become more economical. By trying to become more standardized and economical, students with different learning styles may not be taught in the way that stimulates their style.

Can We Customize Economically within the Present Factory Model Schools?

Early schools in the U.S. were one-room school houses where the education was customized to each student's needs due to multiple age students in the same room. As populations in schools increased, students were placed in age groups and taught the same subjects in those groups in the same way. This didn't allow for customization so each learner could learn using his/her own style. Thus, students were grouped into different academic areas due to the way subjects were taught. Science and math teachers typically teach using their learning style. If a student didn't excel in that style, they would not do well in those subjects. If schools in the U.S. wish to leave no child behind, they cannot keep teaching using the standardized methods established that follow the factory model.

The Potential for Customized Learning in Student-Centric Classrooms

Student-centered learning may become possible in the near future due to technology progress. Hardware and software are progressing where students can learn at their own pace in their own way. Teachers will become learning coaches instead of taking center stage in the educational process.

Chapter 2 Making the Shift: Schools Meet Society's Needs

Disruptive Innovation Theory: explains why organizations struggle with certain kinds of innovation and how organizations can predictably succeed in innovation.

Sustaining Innovations: Innovations that sustain the improvement trajectory in an established market.

Examples: auto manufacturers keep improving their cars and trucks to keep up with the competition, DEC minicomputer (expensive and only affordable to some)

Disruptive Innovation: Innovations that disrupt the improvement trajectory by introducing a product into the market that can be used by a different consumer group. If the company doesn't make the adjustment, they may not be able to compete against the new product and go under.

Examples: Apple IIe, Kodak camera, Sony transistor radio, Ford Model T, Southwest Airlines affordable flights, Google advertising

Applying Disruption Theory to Public Schools: Defining Performance

Analogous to disruption in the private sector, society has moved the goal posts on schools and imposed new measures of performance upon them. Schools are a virtual monopoly due to laws and regulations which makes it difficult and impossible for new business models to compete on the new measures. Society has asked schools to pursue these improvements from within the existing organization, which is designed to improve on the old performance metric. This is analogous to rebuilding an airplane in mid-flight. No business in private enterprise has been able to do this. Schools have been doing this ever since they began.

History of education

Job 1: Preserve the Democracy and Inculcate Democratic Values

In the 1830's and 1840's, Horace Mann led the charge for formalizing school. The three level system idea was desired by Thomas Jefferson and Noah Webster but never enacted. Most of these schools were one room school houses. Only the elite continued on to school beyond elementary school.

Job 2: Provide Something for Every Student

In the 1890's and early 1900's, to compete with the industrialized Germany, society asked schools to prepare everyone for vocations to create a sound work force. High schools had to expand and offer more courses for students going into many different careers. Schools had to transition from the one-room school house to grades and buildings that offer courses to different age groups. Traditional course work like Latin and Greek were dropped for art, music and vocational courses so students could enter the job force right out of school.

1950's delivered two shocks to education, neither were disruptive.

1954 Brown v. Board of Education required the desegregation of schools.

1957 Soviet Union launched Sputnik, which began the space race. 1958 Life magazine "Crisis in Education" due to the Soviet Union beating us into space.

1960's and 1970's parents from the post Great Depression who grew up in prosperity wanted more for their children. AP programs, more offerings in the fine arts and more offerings in athletics for boys and girls changed the schools in this country even more.

Job 3: Keep America Competitive

Starting in the 1960's, Japanese companies began disrupting U.S. markets. Gross Domestic Product dropped because Canon disrupted Xerox, Japan car companies disrupted U.S. automakers, Sony disrupted RCA, etc. U.S. competitiveness was questioned.

1980's US companies downsized and schools were again looked at for the answers. Performance standards were now looked at by society and they found that American schools scored lower than countries that focused on education only in schools. SAT scores had been found to be in decline from 1963 into the mid 1970's. Society now wants schools to change their job again: improve test scores.

1981 U.S. secretary of education created the National Commission on Excellence in Education

1983 National Commission on Excellence in Education published “A Nation at Risk” which stated that too many courses were being offered and students were not completing important courses. The goal posts had been moved once again.

New disruptive business models have not been created for public education. Since disruption occurs with nonconsumers, and public schools require all students to attend, there is not a pool of nonconsumers to draw from and new models cannot be created.

Even though schools have not been able to find a new model, they have done well. NAEP scores in math and reading have been increasing since the early 1980’s. School populations have risen and composition has shifted more towards groups of students that have traditionally not done well.

Job 4: Eliminate Poverty

No Child Left Behind made test scores the primary metric for performance. Goal post again have been moved. Percentages of students meeting proficient on test scores are now the new goal. Eventually, all students must be proficient in reading, math and science to help eliminate poverty.

It’s Not the Teachers and Administrators

Can the switch to student-centric classrooms with computer-based learning happen? Some think no due to an old gripe about schools-teachers and administrators aren’t motivated to improve. Most are motivated despite the constant disruptions imposed upon them.

Teachers and administrators need the right tools and strategies for the innovations from technology to have impact. Billions of dollars have been spent on computers in schools. Software up to now has been geared towards the traditional teaching model. Scores have not improved because of the computer.

Ch. 3 Crammed Classroom Computers

Today’s education with computers isn’t any different than how it was done a generation ago. The computer is being used as a research tool and word processor. In 1996, President Clinton announced a vision for computing in schools.

1. Modern computers and learning devices available to all students
2. Classrooms connected to one another and the outside world
3. Make educational software an integral part of the curriculum and as engaging as a video game
4. Teachers ready to use and teach with technology

The first two have been fulfilled, but the last two need to become a reality. Computer-based learning needs to be implemented to disrupt the instructional job that teachers do so student-centered learning can take place and teachers can give more individual instruction.

Deploying Disruptive Innovations Against Nonconsumption

To succeed, disruptive technologies must be applied where the alternative is nothing.

Technology Implementation and the Legislative Process

In government as well as private industry, innovative ideas are changed to meet the demands of all parties involved, so in the end, the innovative idea looks far different than the original idea.

Unless top managers actively manage the disruption process, the organization will change the disruptive innovation into a sustaining innovation. Organizations cannot naturally disrupt themselves, unless they are a new company. This is why computers haven't changes schools.

Selling new disruptive products using existing infrastructure to existing customers is called cramming.

In 1947, AT&T's Bell Laboratories created the transistor which is the beginning of solid state electronics. The transistor was disruptive to the vacuum tube. RCA licensed the transistor and spent a billion dollars trying to make the transistor work in televisions and table-top radios, but the transistor couldn't handle the power required for these large electronic devices. In 1952, the transistor was used in a hearing aide device. In 1955, Sony introduced the first pocket-sized, battery-powered transistor radio. It was inferior to the table-top radios of the day, but Sony marketed it to nonconsumers-kids. Kids could now listen to their music away from their parents when they wanted. In 1959, Sony introduced the first portable television that used the transistor. Both the radio and television appealed to a non-consumer market, groups that couldn't afford the larger televisions and radios. The product was better than nothing. Eventually, solid-state electronics evolved and companies like RCA that produced vacuum tube products had to change or fold.

Cramming Computers in Schools

Schools have crammed computers into schools with traditional educational models. The teachers used the computers to sustain their existing practices.

How to Implement Computer-Based Learning: Lessons from Rachmaninoff

The technology will only become successful if it is allowed to compete against non-consumption, which is better than nothing. Then it can improve little by little and change the way learning takes place in schools.

Ch. 4 Disruptively Deploying Computers

Areas where disruption has occurred in schools is where computer-based education was better than the alternative-no education at all. Examples include: AP classes; small, rural and urban schools that cannot offer breadth; credit recovery for students needing to graduate; home-schooled children; special needs students; prekindergartners.

Computer-based learning is the first step in the disruption. The above are good examples.

Student-centric learning is the second step in the disruption. Students can learn using their type of intelligence and learning style. The learning will be customized to the student.

New-Market Disruptions Take Root

Significant areas of non-consumption where computer-based learning has taken root:

- AP classes-college level classes offered in high school
- Rural schools not being able to offer courses due to lack of teacher/money
- Urban high schools in low income areas
- Homebound and home-schooled students
- Credit-recovery students
- Pre-kindergarten students
- Private tutoring

Meeting the Demand

More than 25 states have virtual schools.

Following a Disruptive Pattern

When a new approach or technology substitutes for an old one because it has an advantage over the old, the substitution pace follows an S-curve (slow to start, steep increase, then slows again).

The problem for industry leaders is that the projection starts out slowly, therefore they don't worry about the disruption. But when the disruption flips fast on them, they become crippled. An example includes digital photography (Polaroid gone, Fuji struggling). Business must learn to predict when the flip will occur to determine how much time they have. They must make a substitution curve. The substitution curve for online courses in high schools predicts that by 2019, 50% of courses will be delivered online.

Factors That Will Accelerate the Substitution

1. Computer-based learning will keep improving
2. Teachers, students and parents will be able to select a pathway that best suits each student
3. Teacher shortage
4. Falling costs

The Sequence of Substitution

Schools are disinvesting in the "nice to have" courses in favor of courses needed to improve test scores for NCLB. Dropping these courses for the above reason and due to budget cuts creates an area of non-consumption where student-centric online technology can be deployed.

Computer-based learning providers must figure out how to teach more courses more effectively.

Government officials must not penalize schools financially if students enroll in online courses.

The Future Classroom

Virtual classrooms-chemistry (Virtual ChemLab)

Games

Teachers will be learning coaches, helping each student with his/her own individualized instruction.

Teacher-student ratios can increase because of the individualized learning. This may save the district money on teachers and allow for the existing teachers to be paid a little more.

The Future of Assessment

Current method of assessment- time is fixed but the result of training is variable and unpredictable (installing a car seat on an assembly line at a Detroit auto plant). Seats were tested at the end to see if they were installed correctly.

Student-centric method of assessment-time is variable and result is fixed and predictable (Japan auto assembly line). Mastery of each step must happen before you can move on to the next step. There will not be a need for inspection at the end of the assembly line. Mastery can be verified continually to create tight, closed feedback loops.

Students can be compared not by what percentage of the material they have mastered, but by how far they have moved through the body of material.

Assessment methods will need to evolve.

Ch. 5 The System for Student-Centric Learning

Disruption is a two state process. The second stage, where platforms emerge that make it simpler to build computer-based learning products, will cause the “flip” and make student-centric learning a reality.

Embedding a disruptive product in an entirely disruptive commercial system is key to achieving less expensive solutions than was available in the first stage of disruption.

Disrupting the Commercial System

Sony disrupted the the market with the introduction of the transistor. Appliance stores wouldn't sell the small radios or televisions because they made their money from fixing vacuum tube televisions and radions. But the discount stores who couldn't service the large appliances were more than happy to sell the new products. Sony disrupted RCA and Zenith. The solid-state component makers disrupted the vacuum-tube makers. Discount sales chains disrupted the appliance stores.

Three Types of Business Models

Solution shops-employ highly trained experts that diagnose problems and recommend solutions

Value chains-manufacturing, retailing and food service companies

Facilitated user networks – customers exchange with each other

Public Education's Commercial System

The present system is a value-chain business.

Step 1: Producing and Distributing Textbooks and Instructional materials

The textbook industry is a scale-intensive value-chain business

Step 2: Marketing and Distribution

Textbook adoption is done to fit as many learning styles as possible into one book. Once the publishers sell to a few large districts, they are making money. This cements the system in monolithic, large-scale products. Student-centered learning products need to follow the user network model instead of the value chain model.

Subsequent Steps: teaching students in a monolithic mode; offering individualized instruction where possible; testing monolithically. Step 6 is the teacher training to teach in a monolithic educational system

How Integrated Software Solutions Fit into this Commercial System

Software will have difficulty because of funding, standardized tests, mandates from different levels of policy. Since the software is being introduced into a sustaining market with established methods, it won't succeed.

Disruption Toward Student-Centric Learning

Two factors that were absent in stage one (software is complicated and expensive to build) are now in place: platforms that facilitate the creation of user-generated content (application programs) and a user network.

Platforms are tools that allow nonprofessionals to create software that helps different types of learners master topics.

User-networks will allow these application programs to be shared.

When these applications are created by people with different learning styles, the method of the application may pertain to others of the same learning style, thus creating more available tutoring techniques for the different learning styles.

Chapter 6: The Impact of the Earliest Years on Students' Success

Most of the basic intellectual capacities of children have been determined before kindergarten.

Three core elements of preschool preparation:

1. Creation of intellectual capacity in early childhood
2. Cultivation of strong, positive self-esteem
3. Stimulation of intellectual curiosity (life-long motivator for continual learning)

The most powerful factor influencing reading skills is auditory process skill, which is honed as infants listen to parents speak to them in sophisticated, adult language.

Maybe we should teach students how to be parents before they become parents.

Chapter 7: Improving Education Research

How Descriptive Bodies of Understanding are Built: Descriptive Stage and Prescriptive Stage

Descriptive Stage: preliminary stage which has three steps-observation, categorization, association

Observation: describe the phenomena as accurately as possible

Categorization: classify the phenomena based on characteristics

Association: explore the relationship between category-defining attributes and outcomes of interest

Most educational studies are trapped in correlative studies. Prescriptive understandings can only be attained by improving descriptive research.

Improving Descriptive Bodies of Understanding

Anomalies do occur and must be studied beyond the correlation studies, where most educational research stops.

The Transition from Descriptive to Prescriptive Bodies of Understanding

Prescriptive research is based upon well-researched categories of circumstances that can allow administrators and teachers to predict what actions will lead to the desired result of the given circumstance.

What Makes Statements from Research Valid?

Reliability-increasing sample size

Internal Validity-conclusions logically derive from the premises and where there are no other plausible explanations for the measured correlations

External Validity-built when researchers have defined the complete set of situations or circumstances in which people might find themselves with respect to outcomes of interest

Ch. 8 Forging a Consensus for Change

Charting the Degree of Agreement

Creating a graph with Extent to which people agree on cause and effect on the X-axis and Extent to which people agree on what they want on the Y-axis gives us a good idea of what direction to go when creating change.

Mechanisms of Movement

Two mechanisms can shift an organization using the above matrix:

1. Success-shifts the matrix to the upper right
2. Common language and methods to frame a problem

Moving from Agreement to Cooperation

Tools of Cooperation

Power Tools: fiat, coercion, force and threats (keeps the matrix in lower left area)

Management Tools: training, standard operating procedures, measurement systems (lower right)

Leadership Tools: results-oriented tools ie. Charisma, vision, salesmanship (upper left)

Culture Tools: consensus on priorities and actions to achieve priorities ie. Religion, democracy, folklore, rituals, tradition (upper right)

Separation-if no consensus can be reached, divide the parties into separate groups so they can be in agreement within their group without agreeing with others in different groups.

Public School System in the Matrix

Schools fit in the lower-left corner (low on agreement and priorities)

Common Language

Common language may cause a shift in the matrix up or to the right.

Power

Political and school leaders must become more comfortable wielding power if they seek fundamental change. It is hard to get everyone to agree on priorities when officials are elected. Some cities have done away with school boards so the mayor can appoint a superintendent with the same vision.

Separation

Separation may be needed if a group cannot agree. This has resulted in charter school, voucher schools, and pilot schools. A group of people with common priorities and agree on these priorities are put together.

Ch. 9 Giving Schools the Right Structure to Innovate

The Soul of an Organization

When the task of improving individual components occurs, the organizational structure facilitates the improvements. When a system needs to be fundamentally reconfigured, an organization's compartmentalized structure impedes the work. Innovating managers must ensure that the teams' structures are suited to the nature of the job. For this, the tool of separation sometimes needs to be used.

A Model of Organizational Design

Four types of teams to fix problems:

Functional Team: teams that exist within departments

Lightweight Team: Teams comprised of leaders from each department

Heavyweight Team: Members that must transcend boundaries of their functional organizations to interact in different ways. This team is formed when new relationships must be created amongst departments. This team is a tool of separation. Temporary team.

Autonomous Business Unit: Managers are tackling a disruptive business model. This team is a tool of separation.

Innovation and Organizational Structures in Public Schools

Schools are built to have functional teams and lightweight teams. For schools to change, heavyweight teams need to be created to redesign schools at the architectural-level to change the curriculum.

Heavyweight Teams

Chartered schools, pilot schools in Boston

Spreading and Codifying New Architectures

If the above organizations work, they will need to be codified. That could be done within the organization itself or done by state governments. Philanthropic organizations could fund researchers to study the models that work and they could codify them.

A method will need to be created to determine what students need to go to what schools.

This process will need to be replicated so all districts can follow this method of getting students into the learning environment that best suits them.

Conclusion

Five major messages in the book:

1. Few reforms have addressed the root cause of students' inability to learn.
2. School reformers have tried to bash the system and confront it head-on.
3. If we realize that all students learn differently and keep teaching in a monolithic way, customized education will never occur. A modular system must be developed.
4. The area with the highest potential to customize learning is with the online user networks.
5. If implementation of customized learning is to happen, administrators and school leaders must use tools of power and separation.

To the leaders of school systems-use the right tools to introduce change, facilitate disruption, hire a person to implement online courses, don't kill the disruption by having online programs strip funds from other needs in the district or compete against the existing system.

To philanthropies and foundations-help fund this disruption and research.

To entrepreneurs-invest in technological platforms for students, parents and teachers so they can all teach each other

To teacher training colleges-teach the skills necessary to work with students one-on-one using the learning style that each individual best learns while using.

To graduate schools of education-progress beyond descriptive research: study anomalies and outliers.\

To teachers, parents and students-when no courses are available at school for certain students, search for them online and seek credit from the school

I believe the ideas in the book can be used to integrate technology into the classroom. It is slowly being done in certain areas where there is nothing at all (credit recovery, home schooling, lack of teaching staff). Like anything, it will slowly evolve, but the ideas in this book could speed the process up. Everyone would have to buy into the process for it to work.