

Zeitschrift:	SPELL : Swiss papers in English language and literature
Herausgeber:	Swiss Association of University Teachers of English
Band:	26 (2011)
Artikel:	The efficiency of images : educational effectiveness and the modernity of motion pictures
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DOI:	https://doi.org/10.5169/seals-283961

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The Efficiency of Images: Educational Effectiveness and the Modernity of Motion Pictures

Scott Curtis

This essay places early educational film (roughly between 1900 and 1930) in the context of the impulse toward “efficiency” that swept the industrialized nations after the turn of the twentieth century. Drawing on educational literature in the United States and discussions of medical education and training films in France and Germany, the essay describes how educators articulated the efficiency of the (moving) image, especially in terms of the cost of teaching or the psychology of learning. Ultimately, the essay argues that the deployment of visual materials in the classroom during this period is best understood through the rubric of “efficiency.”

The visual culture of modernism takes many forms. Thomas Elsaesser’s essay in this volume clarifies film’s place within this culture, and the role of film studies in the modernity sweepstakes. He indicates a new direction in film studies, which this essay will follow. That direction, toward images that are not meant primarily for entertainment or aesthetic purposes, depends on a crucial differentiation between two cultures of modernism. Anson Rabinbach, in his classic tale of energy and fatigue, *The Human Motor*, makes a useful distinction between “cultural modernity” and “social modernity.” We are most familiar with “cultural” modernity: the responses in science, art, literature, and philosophy to the rapid industrialization of the Western world during the last half of the nineteenth century. From Einstein to Picasso to Proust to Bergson – most surveys of modernism round up the usual suspects and tell a familiar story of cultural products that helped to organize, usually in an aesthetic way, the changes to perception of time, space, and social relations wrought by modernity. But alongside these examples emerged another,

The Visual Culture of Modernism. SPELL: Swiss Papers in English Language and Literature 26. Ed. Deborah L. Madsen and Mario Klarer. Tübingen: Narr, 2011. 41-59.

related response, not necessarily aesthetic, which hoped to apply “new scientific modes of perception to social questions” and to bring “to bear a spirit of utopian and scientific ‘neutrality’” to the class and ideological rifts that came with these transformations in the public sphere (Rabinbach 86). In other words, alongside writing a novel or painting a picture, an equally valid and pervasive response to the ruptures of modern life hoped to bring the fruits of modernity – such as science, technology, and a sense of progress and hope – to bear on real social problems. So we might label “social modernism” the attempts by a different cast of characters – including reformers, scientists, educators, and lawmakers – to come to grips with these upheavals by using the tools that modernity provided.

So, for example, workplace reform laws, health and hygiene campaigns, the scientific study of fatigue, reformers working against poverty or alcoholism – all of these might count as “social modernism.” And all of these efforts included a “visual culture” as well, but with a strong utilitarian interest. So this essay will explore a visual culture of modernism that includes what we might call “useful images” – what Elsaesser calls “operational images” – especially educational film.¹ Of all of the strategies to manage the disruptions brought by changing demographics and rapid urbanization, education counted among the highest priorities, not only because it was an obvious means of social betterment and control, but because of its equally obvious value for nation building. Leaders of all the western nations realized that in order to consolidate and modernize their nations, they would need to standardize and modernize their children through education. And if “social modernism” is distinguished by its eagerness to bring scientific approaches to bear on social problems, education was no exception. Early-twentieth-century pedagogical literature is littered with experiments designed to examine the effectiveness of this or that instructional tactic. “Efficiency” became the primary means through which this wish for effectiveness, modernization, and control was expressed in all sorts of disciplines, including education. “Visual instruction” was an equally hot topic in educational circles in Europe and the United States in the first two or three decades of the twentieth century. Indeed, if visual aids to instruction were popular throughout the nineteenth century, the discussion of the educational value of images became even more urgent with the development of motion pictures. So by the 1910s, “efficiency” and “images” decisively con-

¹ There is a growing scholarship on “useful film” and educational film. See, for example, Acland and Wasson; Orgeron, Orgeron and Streible; Hediger and Vonderau; or the special issues on “Gebrauchsfilm” in *montage/av: Zeitschrift für Theorie und Geschichte audiovisueller Kommunikation*.

verged in pedagogical theory, especially but not exclusively in the United States.

Thomas Edison provides an oft-cited example:

I believe that the motion picture is destined to revolutionize our educational system and that in a few years it will supplant largely, if not entirely, the use of textbooks. I should say that on the average, we get about two percent efficiency out of schoolbooks as they are written today. The education of the future, as I see it, will be conducted through the medium of the motion picture . . . where it should be possible to achieve one hundred percent efficiency. (quoted in Wise 1)

As we know, Edison was not shy of hyperbole when he was selling his hardware, or in this case, his software – his series of films aimed at the educational market. Professional educators were also aware of his rhetorical habits, and viewed his claims of the power of motion pictures with a healthy dose of skepticism: more than one commentator called his prediction that film would replace textbooks “absurd” (“Among the Magazines” 109). Even with our defenses up, however, we can’t help but marvel at his bold and somewhat baffling use of fake precision: textbooks are only “two percent” efficient, but with the motion picture in the classroom, “it should be possible to achieve one hundred percent efficiency”? Really? What could that possibly mean? Did he imagine that motion pictures would channel knowledge directly to the student’s brain? Did he anticipate a *Matrix*-like scenario in which children were jacked into projectors and information was “downloaded” as easily as flipping a switch? Actually, yes. Not in so many words, but Edison and others, such as the Keystone View Company, which made lantern slides and stereographs, were clearly imagining or selling an educational setting in which the outdated “inefficiency” of *words* is replaced by the modern “efficiency” of *images*. (A typical Keystone View Company ad appears in *The Educational Screen* [February 1923, 67]). And even though educators were quick to scoff at Edison’s exaggerations, their assumptions about the growing role of images in instructional technology had more in common with his wild vision than they cared to admit. Salesmen of all sorts echoed Edison’s rhetoric, but their pitch corresponded to ideas common in the scholarly community as well.

On the one hand, this claim about the efficiency of images is simply a modern invocation of the presumed directness of pictures and perception (as opposed to words), a concept dating at least to Descartes and Locke, and invoked every time we claim that “a picture is worth a thousand words.” On the other hand, Edison’s boast carries something more than the usual philosophical baggage: it assumes that images, especially

moving images, are themselves *modern*, and that they can be implemented with scientific precision and efficiency to solve social problems. So the goal of this essay is to explore what it means, exactly, for an image to be “efficient.” The more I examine the early primary literature on visual instruction, the more I am convinced that this notion of “efficiency,” which combines the wish for scientific precision and modernity with the dream of immediate gains and human perfectibility, is the guiding principle for the deployment of slides, photographs, stereographs, and motion pictures in the classroom. And if we are interested in “the visual culture of *social modernism*” – or the use of images to solve social problems – then we will find no better example than the educational film. So this essay will examine the varieties of cinematic efficiency by focusing on the early discourse of the educational film in the United States and Europe from 1900 to 1930. It is my contention that the best way to understand the deployment of useful images in social modernity is through the rubric or historical framework of “efficiency.” That is, the visual culture of social modernism is as vast and complex as the aesthetic realm, but one way to make sense of this visual culture is through the idea of efficiency. However, this is not an exclusively American phenomenon. Specifically, I have found that the medical communities in Germany and France were especially intrigued and articulate about the efficiency of the moving image, so this essay will compare those discussions to the mainstream literature in the United States on educational images.

The Cult of Efficiency

Anyone familiar with modern agendas will recall how widely the concept of efficiency spread through the United States and Europe during the first three decades of the twentieth century.² “Efficiency” was commonly used in the early and mid-nineteenth century as a technical term referring to the potential of a machine to generate energy with the least amount of fuel and the least amount of heat loss. To be efficient was to eliminate waste – in the case of a machine, it meant eliminating the inevitable waste of energy. This also meant that efficiency was never fully attainable; efficiency was, as Evelyn Cobley has pointed out, “marked by a dynamic totalizing desire intent on achieving an always receding static or perfected totality” (9; see also Alexander). The ideal of efficiency, in other words, was always utopian, and has within it the dream of perfectibility. But this relatively innocuous idea of the perfectibility of ma-

² On efficiency as a cultural phenomenon, see Hays; Haber; Tichi; Andrew.

chines eventually slid into the social realm, and through the efforts of reformers, managers, and such, “efficiency” became a vision of *human* perfectibility. As it seeped into the social realm, this technical ideal became a strong moral value, in danger of functioning no longer as a means, but an end in itself. And just as “efficiency” signaled a utopian hope of human perfectibility, it simultaneously described the darker side of rationalization and a tendency toward dystopian social control.

Nevertheless, the idea of efficiency caught on. Theodore Roosevelt proclaimed in 1909 that “in this stage of the world’s history to be fearless, to be just, and to be efficient are the three great requirements of national life” (Roosevelt 7261). Between 1903 and 1910, Frederick W. Taylor spread his ideas about shop management, which viewed the factory as a machine and its workers and foremen as cogs to be perfected, thus forming another lynchpin between the technical and social ideals of perfectibility. In 1910, Congress’s Interstate Commerce Commission held a hearing on railroad freight rates. This hearing, during which experts testified that by applying Taylor’s principles they could reduce cost and increase wages, generated an enormous amount of attention in the popular press. Thus “scientific management” was born.³ Taylor’s disciples and competitors, Frank and Lillian Gilbreth, extended his ideas into the visual realm by using motion picture and photographic technology to record, analyze, and perfect worker movements.⁴ After 1911, it seemed that every business and institution in America was worrying about how to increase its “efficiency.” Indeed, in just a few years, the rhetoric of efficiency pervaded every aspect of social life, starting with business and institutions, moving to government, to self-improvement, even to Sunday school.⁵ No realm of national life was left untouched. Even artists got in on the game: Suzanne Raitt has discussed the rhetoric of efficiency in Ezra Pound’s literary ideals, in which no word was wasted, while Sharon Corwin has shown how the clean lines and standardized geometries of Precisionist painters of the 1920s and 30s recall those of the Gilbreths in their images of efficiency. In fact, these images and others contributed to our sense of what it meant to be modern; it meant to be accurate, stream-lined, and efficient.

³ On Taylor and scientific management, see Calvert; Nelson, *Rise of Scientific Management*; Nelson, ed. *A Mental Revolution*; and Kanigel.

⁴ On the Gilbreths, see Price; Lindstrom; Corwin; Brown; Curtis.

⁵ For a sampling of the popularization of “efficiency” in American culture, see Bennett; Cope; Taft; or Purinton.

Education did not escape this pressure to be efficient. According to Raymond Callahan,

The publicity given to scientific management and the great claims made in its behalf intensified the public's feeling that great waste existed everywhere, and at the same time offered a means of eliminating it. One result was that a new wave of criticism was directed against many institutions, especially those large enough to be suspected of gross managerial inefficiency and those supported by public taxation. (46-47)

Schools met both criteria, of course, and were subject to a near constant barrage of attacks during the early 1910s, which swelled into a public demand to apply the principles of scientific management to public schools. Stories such as "Medieval Methods for Modern Children" in the *Saturday Evening Post* in 1910, attacked the school system as inefficient and outdated (Warren 11ff). Educators were forced to explore what it meant to be an "efficient" teacher, often by using methods from the still emerging field of social science (see, for example, Monroe and Clark). This is the bandwagon that Edison tried to join with his hard sell of the educational film.

The medical community in the United States also came under the spell of scientific management. But in this sphere, the results were more tangible, perhaps because nineteenth-century hospitals had so much to improve upon. Efficiency was a key concept in transforming the turn-of-the-century hospital from "a well of sorrow and charity" into a "work place for the production of health" (Starr 146). In the United States from around 1900 to 1920, health officials were increasingly dissatisfied with the duplication of services, the lack of coordination of units, and the general low level of effectiveness in patient care among clinics, dispensaries, and hospitals nationwide. "Efficiency" became an institutional logic to promote standardization of facilities, services, and administration. In fact, in the United States at least, efficiency was the rubric through which the modern hospital adopted business practices in order to establish itself as a desirable place for treatment and to attract paying patients. *Modern Hospital*, the organ of the American Hospital Association, devoted itself to promoting economy and efficiency in hospital management, while the American College of Surgeons was established initially to focus on the standardization of tools and techniques within surgical practice (Rosen; Arndt and Bigelow).

Motion pictures played a small, if interesting role in the standardization of the American hospital, notably through medical training films. For example, we know that the Gilbreths used motion pictures to guide the movements of factory workers. It is not well known, however, that

between 1912 and 1917 the Gilbreths focused their attention and technologies primarily on surgeons.⁶ This move was, in part, a clever publicity strategy; the Gilbreths felt that if they could persuade surgeons of their methods, they could persuade anybody (Nock). In fact, they did have some influence; a number of surgeons considered themselves disciples of Gilbreth efficiency and peppered the journals with articles extolling the benefits of motion study and proper workplace organization (see Dickinson, “Standardization of Surgery” and Dickinson, “Efficiency Engineering”). In their own writings, the Gilbreths focused on standardization of surgical tools and techniques, on one hand, and operating room efficiency on the other (Gilbreth, “Scientific Management”; Gilbreth, “Motion Study”; see also Baumgart and Neuhauser). The Gilbreths made their pitch to a number of hospitals on the east coast, and were successful in bringing surgeons to their home in Providence for “standardization conferences.” There is some question, however, about the role of film in their approach. The films that I have seen – which are by no means the only ones – are inconclusive. In some films, the camera placement is such that it is unclear what help it could be. Other films focus on operating room organization, picturing surgeons and nurses with numbers and letters on their smocks. The Gilbreths urged the establishment of the system whereby nurses hand surgical instruments to the physician during the operation. Indeed, we should note that the Gilbreths were hired as consultants and they used film as part of a larger system for recommending changes in workplace design. In this sense, their use of film as a training device is atypical. Much more typical is the use of films as an educational tool in medical school curricula and in professional settings, such as conferences.

Even so, within the discussion of training films the same ideas about efficiency are evident: film can train surgeons to more efficient techniques, and it was considered an especially efficient training tool. I will return to the efficiency of the medical training film, but let’s now turn our attention to more generic versions of the educational film. In both Europe and the United States, film had been used educationally since the beginning, as part of public lectures, for example, or even in theaters. Teachers themselves latched on to the potential of motion pictures around 1905 or so; they used available films – such as travelogues, science films, nature films, etc. – in classrooms or, more commonly in the early period, during special screenings in local theaters. But the lack of titles specifically designed for educational use was a consistent problem. In the United States around 1912 there was something of a movement to produce films for teaching, a bandwagon that Thomas Edison’s

⁶ I thank Caitlin Gainty, University of Chicago, for pointing me in this direction.

company was happy to join (see Horne). Edison Manufacturing started making a catalog of films for classroom use, and this is when he appropriates a rhetoric of efficiency that was already in place.

Varieties of Cinematic Efficiency

How can a film be an efficient teaching tool? A survey of the literature on the educational use of film reveals two broad kinds of efficiency: what I will call “administrative efficiency” and “educational efficiency.” The first category refers to statements in which the use of film somehow eliminates the waste of resources. These statements applaud motion pictures – or also simply pictures or photographs – for their ability to reduce the cost per student. It is a category of statement that is therefore concerned primarily with the *cost of teaching*. The second category comprises statements in which the use of film is championed because it contributes to the ease with which a student assimilates information. These might discuss the “directness” of film, for example: the idea that “images send messages straight through the eye to the brain,” as an ad for the Keystone View Company declares. These are statements that primarily concern the *psychology of learning*. The rest of this essay will explore this tentative taxonomy.

So what is efficient about a motion picture? Jennifer Peterson argues that early educational films, such as Edison’s *The Wonders of Magnetism* (1915), follow a Taylorist model of efficiency through their judicious use of one shot per idea. That is, early educational films were often structured in a fairly simple, didactic way: we see a title card announcing the phenomenon, then we see a shot demonstrating that phenomenon. Just as Taylor broke down a worker’s job into smaller, component tasks, so this model of educational filmmaking breaks down the idea of magnetism into various, smaller component views. And it is no great leap from a time study sheet, such as those used by Gilbreth, to a shot breakdown of a film. In other words, Peterson suggests that Taylorist task management may be a model for cinematic form, especially the kind of editing patterns common to educational films in the 1910s and 1920s. So in educational film style we have an example of the modernist, efficient dictum that form should follow function.

This analogy, intriguing as it is, was not part of the conversation at the time, as far as I can tell; it is a retrospective critical category. Instead, educators discussed cinematic efficiency in other terms, often its contribution to an *economy of scale*. This refers to the simple claim that more people could see a large projected image than could see a small image. But during a time of rapidly growing enrollments, this was no small ad-

vantage. One educator asks rhetorically, “Could three thousand high school students be placed in a spacious auditorium and given at one sitting what it would take seventy-five superior teachers to do in that same time?” (Shepherd 179). The answer is yes, he implies. Film is consistently justified in terms of its ability to serve large numbers of students, either through projection, or through distribution – that is, a film was able to reproduce a teacher’s lesson over and over again, or give the teacher the opportunity to be in more than one place at once. The medical community advocated film for the same reason; not only could it serve research purposes, but also teaching duties. Listen in as one prominent German physician praises the power of cinematography:

And how convenient, how effortless! . . . [Cinema] has a persuasive evidentiary power beyond that of any other document, beyond even the most vivid description. . . . The motion picture projector demonstrates its most spectacular educational applications in auditorium demonstrations of microscopic or macroscopic images of movement. In a normal lecture-room demonstration of movement, especially that of small objects (think, for example, of a frog’s beating heart), only a small part of the audience really sees anything, while in a film demonstration everyone present can observe the presentation equally well. Without the assistance of the motion picture projector, almost all X-ray motion pictures and certainly all motion pictures taken from a microscope could be shown to only a small circle or to only one person at a time. (Kutner 250)

As medical school enrollments in Europe and the United States grew steadily toward the turn of the century, this claim gained traction – lecturers used projected images more and more from the 1870s onward.⁷ A number of famous physicians from the turn of the century, such as Vienna’s Theodor Billroth, collected medical photography and film for precisely this purpose.⁸ There were even efforts to create apparatuses for operating room theaters that would allow greater numbers of students to see surgical techniques as they happened (Duncan, “An Apparatus” and “A Further Report”).

But in the quotation above, Robert Kutner also hints at another kind of efficiency. When he says “how convenient, how effortless!,” he is probably not referring to the motion picture apparatus, which was definitely not convenient and effortless at this time. Instead, he is referring to the efficiency of the image itself. It has a “persuasive evidentiary

⁷ For discussion of the projection of images in medical education, see Stein, *Das Licht im Dienste wissenschaftlicher Forschung* and *Die optische Projektionskunst im Dienste der exakten Wissenschaften*; see also Schmidgen.

⁸ On Billroth’s enthusiasm for new media technologies, see Kern.

power beyond that of any other document, beyond even the most vivid description." For Kutner and others, that power comes naturally to the image, especially to the photographic image. This points to the power of the moving image, especially, to substitute for the thing itself. In the language of educational film, it was most often referred to as "vividness" or "concreteness": R. R. Reeder, Superintendent of the New York Orphan Asylum, exclaimed, "[The motion picture] is the closest thing to actual experience that has yet been discovered" (quoted in Lane 685), while James Newell Emery, a District Principal in Pawtucket, Rhode Island, noted that "In the hands of a skillful and sympathetic teacher there is scant limit to the story that pictures may tell, or the vividness with which they may impress their lessons" (quoted in McClusky 124). H. W. Abrams, Chief of the Bureau of Visual Instruction at the New York State Department of Education, offered a similar opinion: "The distinctive merit of motion pictures in education lies in their concreteness" (quoted in McClusky 122). What exactly is this "vividness"? As we know, the clarity, texture, and abundant detail of the photographic image combine with projected movement to give the image a *presence* unlike any previous representational form. Its level of detail allows the photographic image to reproduce patterns of texture and variation, hence to represent the structure and randomness of the natural world, while the movement of the image presents this world in real time in a particularly striking way. The object "lives" onscreen. This is perhaps obvious, but it is all to say that "vividness" refers to the sense of presence that the moving image gives. For early advocates of educational film, it is as if the thing itself were there in the room, available to direct perception. Film may thus function as an object lesson, an acceptable substitute for the thing itself. Indeed, an avenue for further research might be the precise way that the use of motion pictures in education fits into the long pedagogical tradition of the object lesson. But for now, we can simply note that for many educators, motion pictures were a viable substitute for demonstrations of school subjects, or medical demonstrations, where the use of live patients was always logistically and ethically troublesome.

In the rhetoric of the educational film, cinema's "vividness" was often opposed to a presumed lack of vividness in words and language. Throughout the nineteenth century, in fact, as Pestalozzi's principles of the object lesson gained currency, words and language were pedagogy's philosophical bogeymen. Educators, reformers, even heads of state complained about the excessive amount of "book learning" as opposed to direct encounters with nature and the world. This "direct encounter" was often couched in terms of action, masculinity, and modernity; to be close to nature was not only to be manly and direct, but in terms of

pedagogy, it was to be modern. The motion picture was viewed as “direct,” but also immediate. The rhetoric surrounding the use of motion pictures in education capitalized on these common attitudes: “Children learn through the eye without conscious effort. Dry-as-dust descriptions are replaced with unforgettable *living pictures*” (“Films Beat Books” 34). R. R. Reeder agreed: “Notwithstanding modern improvement and enrichment of the curriculum, the besetting sin of instruction is still ‘words, words, words.’ How much of this will the motion picture correct and eliminate?” (quoted in Lane 686). Dr. Walter L. Hervey of New York’s Board of Education went further: “Fifteen minutes of a motion picture should be more valuable than many hours of textbook work even under a good teacher. . . . In general, it may be said that the best teachers are alive to the fact that . . . more effective ‘execution’ can be done, in a shorter time and on a larger scale, by a good motion picture film than by any other known educational agency or instrumentality” (quoted in McClusky 123). All of these share with Edison a disdain for the word, for the textbook as the primary instrument of learning. But they also presume that the image, by contrast, has a *direct* effect on the mind (we could also discuss the interesting relationship between activity and passivity). This German pundit says it best:

The visual perception of the moving image *directly* elicits the corresponding connection of ideas in the intellect of the observer. . . . Watching moving pictures thus renders unnecessary the active concentration of the will, the kind of concentration required to complete the circuitous intellectual route, to transform visual impressions of letters (or acoustical impressions) into thoughts. . . . The moving image thus caters to the basic principle of all rational thought and rationalistic action: the search to achieve the greatest results with the least possible expenditure. (Demeter 59-61)

As we see here, the idea that pictures, especially motion pictures, have direct access to the mind provided, I would argue, the primary support for the rhetoric of efficiency around educational films. What does it mean for an image to be more “direct” than words? I am not concerned to discover whether it is true or not – I am more interested by this idea’s function as a working assumption in the discussion and deployment of pictures in education. Given that, where does the idea come from? I would venture two possible sources: first, long-standing philosophical claims about the isomorphic relationship between images and ideas or mind, and second, equally long-standing dreams of the ideal medium, which would be perfectly passive and faithful to an original.

At least since Descartes, many philosophers have defined “ideas” as images. Descartes consistently made the analogy that ideas are “like por-

traits drawn from Nature" (406). Or Locke, in his *Essay Concerning Human Understanding*, says that ideas are "Pictures drawn in our Minds" (152) or that the "Idea is just like that Picture, which the Painter makes of the visible Appearances joyned together" (607). Now an important caveat here is that Descartes and Locke are thinking not of concepts, but of sensory ideas – the image that our brain creates from the sensory information gathered by normal perception (see Newman). But the leap to concepts is not too hard to make, and has been made since Plato, perhaps. The point here is that one support for this notion that images are "direct" is the isomorphism between images and the way the mind is thought to work.

Another support is the persistent dream of a perfect medium. If Descartes and Locke conceive of ideas as "pictures drawn in the mind," they evoke not only the act of drawing, but the canvas on which it is drawn. If Nature does the drawing, the mind is a screen upon which these perceptions are etched. Ideally, this would be a blank screen. Lorraine Daston has begun to chart this history of the dream of a blank screen: the tabula rasa of empiricist philosophers, the perfect objectivity of modern scientists – each is an example of the age-old ideal of pure passivity. She asks us to recall the prophet who is the hollow reed through which God speaks, or the fetus upon which the image of the parents is imprinted. Aristotle, for example, understood generation as ideally a literal reproduction, as the active male sperm impressed itself on the passive female matter. As Daston has noted, pure passivity, whether sexual or epistemological, ensured fidelity. The perfect medium was that which was easily "impressed," so to speak, and which reproduced the original faithfully. So, of course, the photographic plate falls neatly into this ideal, and motion pictures even more – they also faithfully reproduce duration and movement. And we might add to this list the mind of the spectator – especially the child spectator – as a potentially perfect medium of reproduction: the effect of the motion picture on the viewer is often expressed in terms of "impression," as in this study:

If we test these same pupils [slower students] for the same facts some time later, we find that the film seems to have made a more permanent impression. In other words, pupils remember facts better by "seeing" them than by reading about them. This in itself probably substantiates the argument that the film is a time-saving device. (Davis 432)

So the "directness" of the moving image depends not only on an isomorphism between image and mind, but also on a dual analogy between the photographic image as faithful impression of nature and the child's

mind as a blank screen or malleable surface which, like the photographic plate, retains the image impressed on it. Motion pictures were thought to function, because of this perceived directness, like an ink stamp on blank paper or like a ring on sealing wax, impressing its information on the child's mind in a quick and efficient manner. And because the motion picture was already a faithful impression of nature, the experience of watching films could be just like an object lesson.

I want to press forward this idea with another example: the training film, specifically the medical training film. Like a film such as *The Wonders of Magnetism*, a training film imparts information, but it differs in asking the viewer to copy it. There is what we might call a "presumption of mimesis" in a training film: take this information, yes, but do as I do, move as I move. Think of an aerobic fitness video, or Gilbreth's motion studies; they ask the viewers to orient their bodies according to those on screen. Images have always had this didactic option, but when motion pictures demand that you "walk this way," so to speak, they capitalize on the already existing visceral pleasure of watching a film. That is, the vividness of a film includes not only the clarity, texture, and detail of the photograph, but also the sense of *movement* that the viewer feels. Surgeons noted this capability right from the very beginning of film history. For example, in Paris in 1897, Eugène Louis Doyen, a maverick surgeon known for his innovative techniques and disdain for the academy, employed two cameramen to film his surgeries. These films were meant to illustrate and publicize Doyen's tools and techniques, but they were also intended to serve as training films for surgeons and, as we shall see, as a means to improve Doyen's own performance (Didier; Lefebvre; on the films themselves, see Lefebvre, "La collection des films du Dr Doyen"; Baptista).

In 1899, Doyen wrote about his use of motion pictures. Complaining about the inadequacy of the practice of rehearsing surgical techniques on cadavers, he asks, "Do our books fill the gap thus left? Certainly not. The most detailed descriptions, the best diagrams or photographs of the various steps of an operation are inadequate. . . . It is not sufficient to follow the operation, as it were, secondhand; rather, the author of the technique, the master himself, must be seen at work. The surgeon is judged by his work, and no text-books, however well-illustrated, can sufficiently express his personality" (580-581, translation modified). In motion pictures, on the other hand, Doyen found a perfect medium to express vividly the personality of "the master himself." Movies are not "secondhand"; they allow Doyen to be "present" to the students. This is another cinematic "efficiency": to be at more than one place at a time. But even more noteworthy is Doyen's concept of "personality." Doyen was not publicity shy, by any means, but he is not con-

cerned here to convey via a medical film his charisma and good looks, or not only those things. Primarily, his films are meant to present technique. More specifically, they demonstrate how Doyen holds himself and how he moves in order to accomplish his task. Film provides, better than any other previous medium, a demonstration of the actual movements required in surgery. Doyen's "personality" is his "posture" or "attitude" – his *embodied* technique. And to convey that "personality" is to presume that the student will copy it, that while the student watches the film, there may be a kind of kinesthetic empathy taking place whereby the movements seen are somehow felt or incorporated into the student's own body. This is the mimetic presumption of all training films, it seems; every training film expects us to copy its movements, and that the student will take on the "personality" or "attitude" of the master. But this kinesthetic empathy is also another brand of "directness": the moving image has an immediate, visceral effect.

Doyen also extends this presumption to himself. He has in mind another form of efficiency: the power of film to improve his own technique. Doyen explains, "When I saw for the first time one of my operations reproduced on the screen, I recognized how far I fell short of my ideal. Many of the details of technique that had seemed satisfactory I now saw to be defective, and the cinematograph has thus enabled me considerably to correct and simplify, and to perfect my operative technique" (582). Fifteen years before the Gilbreths, Doyen claimed he used film to study and correct the performance of work in the name of production efficiency. Whether he actually used film in this way or not is unclear, but the rhetoric is intriguing:

You will notice that each operation is done methodically. . . . The surgeon is calm; his movements are precise and calculated. When he makes a muscular effort, you can see his biceps harden, his face contract, his whole body place itself in the most favorable position. The cinematograph registers the whole scene as it takes place, faithfully, rapidly, and in detail. Each step can thus be studied, analyzed, critiqued. The surgeon can assist at and calmly study his own operations. (582)

The drama of life and death shapes the practiced movements of the surgeon, giving them an urgency we might not encounter in other training film genres. But it is noteworthy that, for Doyen, the cinematograph records details of the surgeon's "personality": the posture, the muscular effort, the position, as if the student could be somehow imprinted with this attitude or orientation. Recalling Jean Epstein's thoughts on the close-up, Doyen here similarly evokes the power of film to literally move us. And recalling Gilbreth and other scientific uses of film, Doyen

notes the power film gives the analytic eye to examine movement at leisure. Here and elsewhere, the educational film provides fertile ground for early discussions of scientific disinterestedness and embodied spectatorship.

There is much more to do: the visual culture of this kind of modernism, which emphasized utility over aesthetics, is vast. But the concept of efficiency, I believe, provides a historical framework for both the practical deployment and philosophical justification of the educational use of motion pictures. Motion pictures were a cutting-edge technology, of course, which also made them appealing for schools trying to modernize, but their rhetorical justification in educational circles depended not merely on its status as a new technology; instead, the concept of efficiency made movies a truly modern method for modern students.

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