Paradigms in the Theory and Practice of Education and Training Design

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Over the years, many authors have tried to describe, conceptualize, and visualize the instructional design or development processes via a variety of process models. Most descriptions imply a rather homogeneous view of design, depicting it as an overall problem-solving process following general phases such as analysis, design and development, implementation, and evaluation (ADDIE). However, researchers who have investigated how instructional designers actually work suggest that the process is much more heterogeneous and diverse than these ADDIE models suggest. This study collected case study data from 24 instructional designers in six different settings; they were identified as experts by their peers. The design processes they used for a specific project were compared to four different paradigms created from the literature. The four paradigms and their underlying theoretical foundations are described and illustrated. Detailed results are reported, and reasons that designers did or did not use a particular paradigm are considered.

Over the years, many authors have tried to describe, conceptualize, and visualize instructional design processes, often starting from theoretical notions and ideas (cf. the 40 models reviewed by Andrews & Goodson, 1991 and Gustafson & Branch, 2002). Most such conceptualizations put forward a rather homogeneous view of design, depicting it as an overall problem-solving process following general phases such as analysis, design and development, implementation, and evaluation (ADDIE). It is regularly asserted, however, that design processes are much more heterogeneous and diverse than these ADDIE models suggest (e.g., Kessels, 1993; Rowland, 1992).

The diversity across projects and designers seems natural because designers create different kinds of products, ranging from site-specific training programs to generic curricula for all levels of elementary and secondary schools. Also, they work in different development contexts with respect to the size of the team, timeline of the project, or size of the budget. The specifics of each context likely require different design processes and activities. But diversity can also be brought about by other factors, such as the designer's amount of experience (Rowland, 1992) or formal design education. Although there are a few studies of practice (cf. Kessels, 1993; Walker, 1990; Wedman & Tessmer, 1993) that confirm the assertion of heterogeneity and diversity, empirical information about what designers actually do is still scarce. Moreover, the reasons that designers conduct or do not conduct specific activities remain largely unexamined.

Reconstruction of the actual practices of professional designers is a first and essential step

toward developing insight into the likely gap between ADDIE models and design practice, and identifying the reasons for this gap. Therefore, a research study was initiated, called Design Approaches in Training and Education (DATE). Through a case study approach, the design strategies of 24 high-reputation professional designers were reconstructed. The cases were articulated and explored in relation to the activities proposed by the traditional ADDIE models (Visscher-Voerman, 1999). The question that guided the study was "What design strategies do professional high-reputation designers use in practice in various training and education contexts?" During data gathering and preliminary analysis, it became clear that there are many differences in what designers do and that they, indeed, do deviate from the activities and order proposed by ADDIE models. It turned out to be very difficult to find patterns or structure in conducted activities across designers. It was realized that, in order to make sense of the variety, the focus should not be on the activity level, but on designers' rationales and reasons for doing so. Therefore, a framework was developed to help demonstrate the differences between designers and projects. This article describes the research method, summarizes the main findings from the preliminary analysis, and then focuses on the framework of design paradigms that helps explain major differences across projects and designers.

METHOD

This *reconstructive* study did not follow a method of traditional research. Instead, a development research approach was used (Richey, Klein, & Nelson, 2003; Van den Akker, 1999). In this type of research, design and development processes are studied sometimes during, but oftentimes after, the developmental process of several interventions. Its purpose is the creation of design knowledge in the form of a new or enhanced design or development model or design principles. In advance of this research process, data gathering was planned in small, successive series to enlarge the chance of reflection in between series and to make necessary changes in research or analysis methods possible. Ultimately, it turned out that two phases of data gathering and analysis were adequate to keep the study feasible and to cover the variety across designers. The flow of the study has been visualized in Figure 1. Below we describe the participants, the procedure for the first phase of data gathering, the preliminary analysis and conclusions, and the procedure for the second phase of data gathering and analysis.

Participants

One of the assumptions of the study was that context variables, such as the level of design, kind and nature of product to be developed, or target group, at least partly determine the way in which designers work. To examine all these variables, six different design settings were distinguished:

1. Design of textbooks.
2. Curriculum development.
3. Multimedia design.
4. Design of internal training and Human Resource Development programs.
5. Design of training and HRD programs in external bureaus.
6. Design of distance education.

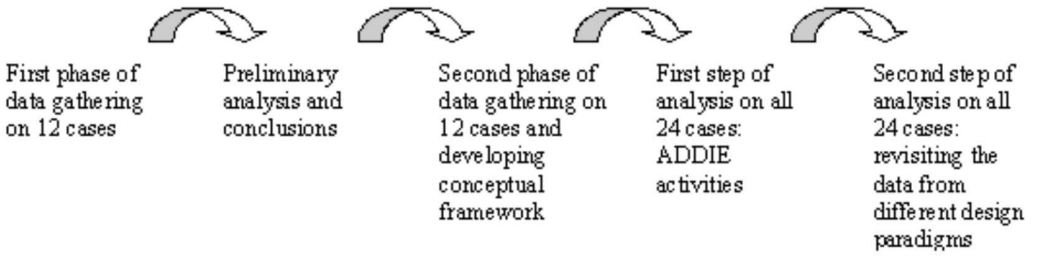
As such, the study used broad concepts of instructional design and instructional designer. The term *designer* was conceptualized as follows (Visscher-Voerman, 1999):

- Invents, conceptualizes, or creates concrete products or materials for instructional or educational purposes (ranging from classroom materials to nation-wide school programs).
- Is responsible for the educational, instructional, or pedagogical aspects of the product.
- Is able to reflect on his or her work.

Design strategy was not used as a criterion for selection, because description of design strategies was an intended outcome of the study.

A "purposively sampling" strategy (Johnson, 1990) was used to select designers from each setting. For optimal results, it was considered more useful to focus on the practice of particularly

Figure 1 □ Flow of the study.



competent, high-reputation professional designers, rather than on average practice, on the assumption that a wider variety of sound practices could be observed. For each of the six design settings, three or four experts were asked to nominate several designers based on these criteria and to indicate why they ascribed to them a high reputation. The experts were either researchers or designers with long experience in the specific setting; they knew most of the designers working there, and were respected by them; and they were familiar with current standards of both clients and designers.

The experts each nominated two to five designers. They used one or more of the following criteria to support their nominations: quality of designed products; satisfaction of clients; creativity or thoroughness of the design approach, or years of experience. Eight designers who were nominated twice or more were selected first; the others were selected at random. All initially selected designers, except one, agreed to participate. Ultimately, out of each setting 4 designers were interviewed for a total of 24 participants. This number was assumed to be large enough to cover likely variety across designers, and small enough to keep the study feasible. Of the 24 designers, 18 were male and 6 were female. The experience of the designers ranged from 3 to 20 years; 11 had a formal design education at the Faculty of Educational Science and Technology, at the University of Twente; 3 had followed other design courses that were provided within their company or by an external bureau. The remaining 10 designers did not have formal design education backgrounds. They either were subject-matter experts or had another, often related, background such as teacher education or educational studies, with extensive instructional design experience.

Procedure for the First Phase of Data Gathering

In the first phase 12 designers were interviewed, 2 per design setting. Data were gathered by means of interviews (primary data) and document analysis (secondary data). The results were summarized in a report and sent to the designers for comments and validation (tertiary data). Designers were interviewed about the design strategies used in a specific project they had completed recently. By focusing on one concrete project, designers were invited to illustrate and embed their statements about the general design approach they apply to a concrete project example. By specifying why they worked that way in the particular project, relevant factors were detected that influence the way designers work. Designers were systematically probed to specify the degree to which the strategies and activities employed in the specific project reflected their general approach. This yielded insight into their general design approach abstracted from the specific context of the project. When appropriate, designers were also asked to specify why they deviated in the project from their general approach and what factors forced them to conduct alternative activities.

Each designer was interviewed twice. Both interviews took at least 1½ hr. In the interviews, data were gathered about personal background (e.g., years of design experience, professional background, job title), chronological description of design activities, quality criteria applied with

respect to both product and process, and the knowledge and methods used in the specific project. Designers were also asked to reflect on the perceived degree of success of the project. Project related documents were used to obtain additional information on the flow of the design process and the decisions made. Document examination was used as a *check* of the interview data and to formulate further answers to the relevant interview questions. For example, the dates of the documents were examined to verify the chronological description of design activities provided by designers in the interviews. Or, letters to clients or other stakeholders and records of design meetings were searched for arguments for activities or decisions taken. In this way, this document analysis helped to reconstruct the design process as accurately and completely as possible.

The first interview was fairly open structured. The interviewer had prepared questions that would help the interviewer identify the steps taken during the course of the design process. Questions were asked, such as: How did the project get started? What was done first when the project was initiated? How did the project evolve? What did you do next and why did you do so? How did the function and format of the product come into being? How often were the function and format redefined? How was that done? The interviewer had also formulated several possibly important themes that had emerged from an initial literature analysis. These were related to problem specification, planning, definition of solution, product revision-process evaluation or reflection, involvement in implementation, and role of stakeholders and communication. As often as possible, designers were asked to specify the reason for specific activities or choices made.

All interviews were taped and typed into protocols. Based on these protocols, three draft reports were generated: (a) designer's profile, (b) project summary (one page), and (c) project description. Designers were asked to read and comment on these; all 12 did, after which the reports were revised based on their input.

Preliminary Analysis and Conclusions

After 12 designers had been interviewed (2 from each design setting), a preliminary analysis was conducted. The revised reports rather than the interview data protocols were used as the basis for analysis. This was done for several reasons. First, the reports summarize the interviews and are, thus, a first reduction of data. Second, designers remarked on these reports and added comments, resulting in the content becoming better specified and validated. And third, several designers added topics to the interview report that were not in the initial interview data protocols.

The goal of the preliminary analysis was to search for an overarching rationale that would help reduce, cluster, and describe the data in such a way that both similarities and differences across design approaches could be interpreted. As a first step, for each designer, the design process used was summarized by labeling the activities using ADDIE terminology. This classification provided insight into the course of actions in the design process of each individual designer. As a second step, for each ADDIE activity the data were reduced in a partially ordered metamatrix by case level, as proposed by Miles and Huberman (1994) for cross-case analysis. These metamatrices listed designers in the rows. The columns referred to main aspects related to the specific ADDIE activity. For example, the columns of the evaluation matrix were labeled as kind of evaluation activity (nature and method), reason for the evaluation activity, output, persons involved, when in the process, and tips for conducting the activity. Based on the analysis of these metamatrices, reports were written for each of the ADDIE activities. A second researcher checked the metamatrices and the reports to increase the internal validity and reliability, as suggested by Merriam (1988).

In line with the results of other reconstructive studies, the preliminary analysis led to the conclusion that activities from traditional ADDIE models are reflected in practice, but that the design approaches and strategies designers use are far more varied and selective, and also more cyclic and integrated. Apart from this variety at the activity level, designers gave different and

sometimes contrasting argumentation for conducting or not conducting certain activities, or they had different perspectives on the worth and value of certain activities. At this moment in the analysis, it became clear that the ADDIE activities were very useful in pointing out the unique *differences* between designers, but were not sufficient to highlight *similarities.* That is, the variety at the activity level was so great that 12 different descriptions resulted, and it was likely that reconstructions of 12 new design processes would add 12 additional unique descriptions as well. This very much hampered comparison and obstructed clustering of the data. Reflecting on the data, discussing them with colleagues, and studying them from different angles led to the realization that the overarching rationale should not be sought on an activity level, but on the level of argumentation specified by designers. It appeared that designers often used the same kind of reasoning and justification for conducting or not conducting certain activities at different moments in their processes, and the number of reasons was less varied than the variety in activities. Philosophical literature then served as an inspirational background to distinguish between different basic types of professional actions, each reflecting different stances toward the world, and as such, delivering different justifications for specific actions. This led to a conceptual framework containing multiple design paradigms.

Procedure for the Second Series of Data Gathering and Analysis

While this conceptual framework was being developed, it was decided that the second phase of data gathering could begin, following the same procedure as in the first phase. Again, two designers from each design setting were interviewed. These data also were put in metamatrices. From this point in the study, data from both the first and second series were treated and analyzed together in the same way as described in the Preliminary Analysis section. The first step in the analysis was to further refine the metamatrices to the subactivity level in order to sketch the range and variation of strategies compared to the activities proposed by the traditional ADDIE models. The second step was to search for underlying rationales for designers' actions leading to an overall characterization of design strategies, and to reduce the variety. The results of both steps are now presented. We have chosen for this article to focus primarily on the resulting framework and design paradigms.

RESULTS: ADDIE ACTIVITIES

In this section we describe what activities designers conduct in their projects. To show the diversity, the focus will be on how designers' actions differed from the activities and phases proposed by the ADDIE models.

Analysis: How Designers Analyzed Their Problems

In traditional ADDIE models, analysis is the first phase in the process, aimed at exploring the problem and its context, usually resulting in a problem definition. Typical activities include needs assessment, in which the need to solve the problem is determined, and eventually determining whether the problem can and should be solved by an educational intervention. If so, then an analysis of the setting includes identification of users, tasks, user environment, and content (e.g., Kessels, 1993; Romiszowksi, 1981; Smith & Ragan, 1999). At the end of the analysis, the remainder of the process is planned and organized. Thus, the outcomes of the analysis phase steer further activities.

From this perspective, the processes of the designers interviewed showed four overall differences with the ADDIE models:

1. Although all design projects started with analysis activities, the majority of designers (19 of 24), conducted a restricted analysis of about one day. Some of them used a *sandwich approach:* They conducted a second and more thorough layer of analysis after approval of the project plan.
2. Generally, the analysis activities resulted in further specification of a potential solution, rather than a specification of the problem.

3. In most cases, designers conducted only a few analysis activities, some rather elaborate, rather than utilizing a range of different analysis activities at the start of the project. Often, analysis activities were integrated with other design activities, such as evaluation.
4. The project plan, supposed to have a funneling influence on the remainder of the project, was formulated at the start of the project rather than at the end of an analysis phase, except in the five cases that conducted comprehensive analyses.

The kinds of analysis and the corresponding number of times the activity was observed were: problem analysis (3); user needs assessment (6); reviewing existing materials or showing examples from previous projects (5); designing and analyzing an early prototype (4); analyzing possible pitfalls and consequences of potential solution (6); content analysis (6); task analysis (8); and feasibility study (5).

Design and Development: How Designers Create Their Products

Design models specify that in the design phase a solution is created based on the problem definition that was the outcome of the analysis phase. Characteristic activities in this phase are the generation and evaluation of alternative solutions (e.g., Feteris, 1992; Vos, 1992), which result in choosing a promising design or blueprint for the solution. While designing a blueprint and further developing the product, as concluded by Andrews and Goodson (1991) in their review of design models, designers are supposed to make a number of decisions regarding creation and selection of a design rationale in the formulation of learning goals; specification of content; selection of instructional strategy; selection of media; and formulation of test items. Later in the development phase, the blueprint is elaborated into a concrete product.

Keeping traditional design models in mind, the designers interviewed differed most remarkably with regard to the following:

- Designers hardly generated and weighed alternative solutions. Instead, they explored alternatives within a given solution setting as specified in the project plan. If they generated alternative solutions, the number was very limited.
- Designers used different strategies with respect to how they developed the function and the format of their products. The design activities were highly integrated and the majority of designers let the function and format of their products coevolve.
- Designers often delegated the responsibility for microdesign activities, such as the formulation of learning goals, specification of content, and formulation of test items to subject-matter experts who were involved in the project.
- Only in larger, often generic, projects did designers report distinct design and development phases. Usually, development activities and design activities were interwoven.
- Rather than being an explicit design activity, as supposed by the traditional design models, the choice for a medium or format for the solution had usually been made before a project started.

Core activities conducted were formulation of a design rationale, formulation of learning goals and content, and selection of test items.

Implementation: How Designers Implement Their Products

Over several decades the curriculum and curriculum design literature has shown consistent attention to implementation activities and dilemmas. In traditional ADDIE models, implementation usually refers to gaining client acceptance of the products of development, perhaps before evaluation has occurred. In curriculum literature, the term *implementation* refers to the actual use of a program by its intended users. Therefore, Plomp's model (1982) showed the implementation phase *after* the evaluation phase. It is assumed in Plomp's model that the usability of the product has already been proven in the evaluation phase and that the product has been accepted (Van de Wolde, 1992) when it is implemented. In the present study, implementation is referred to in this latter sense. Especially

within training settings, implementation may not only refer to the successful use of the program, but also to the transfer of learning results into improved performance (Kessels, 1993). Another characteristic of Plomp's model is implementation anticipation. It specifies that designers should consider implementation factors early in the process to increase chances of a successful implementation. Such early activities include providing information to all stakeholders throughout the project, systematically soliciting input from stakeholders in reference groups, organizing conferences, and providing in-service education or train-the-trainer programs (Van de Wolde). To promote and facilitate implementation in the context of corporate education design, Kessels specified that activities, such as frequent factual contacts with all parties involved, cooperative project management strategies, needs assessment, job and task analysis, involvement of line management, similarity between learning and work environment, selection and instruction of trainers, and careful selection of trainees, all could contribute to a successful implementation.

With respect to implementation and implementation anticipation, the data showed the following patterns:

- Designers were only occasionally involved in the actual implementation of their designed products.
- Throughout the whole design process, all designers paid attention to the upcoming implementation of the product, even though they would not be directly involved in this implementation. These activities were integrated with other design activities throughout the process.
- Although all designers conducted implementation anticipation activities, they differed with respect to the degree to which they felt personally responsible for the implementation. Depending on both their beliefs about what constitutes their tasks, and the resources committed to the project, they could just raise the topic with their client, or make a major effort to incorporate a variety of implementation strategies.

Designers anticipated implementation through four major kinds of strategies: (a) creation of quality materials (9); (b) preplanning of supporting factors in the implementation context (8); (c) stakeholder involvement through codesign or resonance groups (12); (d) and communicating and providing information about the process and the product (12).

Evaluation: How Designers Evaluate Their Products

Traditional ADDIE models have a distinct phase in which the constructed product is evaluated. The purpose of the evaluation is to judge the extent to which the product under development is meeting the quality criteria formulated early in the project. Based on the evaluation information, designers may decide to further develop and implement or disseminate the product, or to adapt and improve it if it is not yet meeting stated goals and criteria. Several cycles may be needed to create a product that meets the criteria. Being distinguished as a distinct phase in the process, the evaluation phase is often visualized as occurring near or at the end of the design process (e.g., Plomp, 1982; Smith & Ragan, 1999). In this respect, a typical evaluation activity is the pilot test or tryout of the product late in its development (e.g., Andrews & Goodson, 1991). However, in recent years, several authors have stressed the importance of formative evaluation and advice to conduct evaluative activities early in the process, integrated with design activities (e.g., Nieveen, 1997; Tessmer, 1994).

With respect to evaluation, the data showed the following differences from traditional ADDIE models:

- Only four designers conducted a tryout and five designers a microevaluation. Yet all designers deliberately conducted one or more other evaluation activities in their design processes. Designers usually conducted their evaluations earlier in the process and thus stressed their formative nature. In this sense, formative evaluation activities were interwoven with design activities, rather than conducted in a distinct phase.
- In only a few cases were formative evaluations systematically and formally conducted

according to previously formulated plans and criteria. Most evaluations were conducted informally, relying on personal judgment of designers and stakeholders involved.

- Evaluations were used not only to check the quality of the product under development, but also to sharpen the design specifications.

The kinds of evaluation activities conducted were front-end evaluation (1), screening by designer (16), expert appraisal (20), micro-evaluation (5), tryout (4), process evaluation (4), and summative evaluation (6).

Conclusion of This First Step of Analysis

In general, design processes differed in the kind and order of ADDIE activities conducted. For example, designers might start with similar analysis activities, but follow different routes in the design and development phase. Designers who worked somewhat similarly in the design and development phases might show a difference in frequency and scope of formative evaluation activities. But designers also differed in how they worked through different ADDIE stages of the design process. Some followed the ADDIE phases successively with, eventually, some iteration, while others jumped back and forth between different phases. Design processes differed regarding the extent to which the ADDIE phases were elaborated and how the phases were interwoven with each other. Processes also differed with respect to the different kinds of activities that were conducted in a certain phase. The data confirmed the diversity of activities reflected by the many models in the literature.

While we were searching for an explanation for the differences or similarities between strategies, our realization grew that a focus on the level of argumentation would be helpful. Designers provided such argumentation when they explained why they conducted certain activities. They seemed to have different, and sometimes contrasting, argumentation for conducting or not conducting certain activities. Or, they had different perspectives on the worth and value of certain activities, which in most cases were tenable from the designer's perspective. For example, one designer regularly showed the client interim versions of the product and asked for critical comments on the basis that this kind of formative evaluation activity is important for increasing the client's commitment to the product. In contrast, another designer did not show the client the product until it was almost finished, while arguing that this was important to maintaining the client's commitment by not showing an earlier, less perfect version. Likewise, the first designer argued that good design processes need to start with a detailed analysis so as to specify clients' needs, whereas the second designer argued that front-end analyses are not useful because it is impossible for clients to specify all requirements at the start of a project. These examples show that designers had completely different conceptions of what they called a good design and what constituted a good design process.

While searching for a structure in these differences in argumentation, we found an anchor point in the philosophical literature. Philosophy provided a useful background for helping trace back the origins of the different design approaches to different basic types of design paradigms, each reflecting different stances toward the world in general, and toward design in particular. This led to the formulation of a conceptual framework consisting of four design paradigms. Although all four paradigms are described below, only three were supported with data from the study. The four paradigms are:

1. Instrumental paradigm: planning-by-objectives.
2. Ccommunicative paradigm: communication to reach consensus.
3. Pragmatic paradigm: interactive and repeated tryout and revision.
4. Artistic paradigm: creation of products based on connoisseurship.

RESULTS: ALTERNATIVE DESIGN PARADIGMS, CONCEPTUAL FRAMEWORKS AND EMPIRICAL FINDINGS

There are four main movements—(a)modernism, (b) critical theory, (c) pragmatism, and (d) postmodernism—that reflect basically different stances or rationalities toward truth and truthful acting in science (Coyne, 1995; Self, 1997; Visscher & Schulten, 1997). These movements provide the underpinnings of each of the design paradigms. In the following sections, the general assumptions and rationality of each design paradigm and its related specific design actions are briefly described, as well as its roots in philosophy and scientific research. These are followed by several exemplary illustrations from practice. For this purpose, the interview data were scanned. Then one researcher placed the designers in only one paradigm, making use of the theoretical and philosophical underpinnings of that paradigm and what appeared to be the designers' dominant perspective and activities. A second researcher did the same, and outcomes were compared. The final outcome of this discussion was used as the basis for further analysis.

Instrumental Paradigm

Design is often depicted as an instrumental process that starts with the formulation of specific goals and outcomes for the product to be designed. A majority of the instructional design models in the literature are based on an instrumental rationality, such as those by Dick and Carey (1996), Gagné, Briggs, and Wager (1992), Gerlach and Ely (1980), Morrison, Ross, and Kemp (2001), and Reiser and Dick (1996). Advocates of this approach in the domain of curriculum include Bobbitt (1924), Posner and Rudnitsky (2000), and Tyler (1949).

Description of design as an instrumental process. Within the instrumental paradigm, a design is good if it meets a prespecified and absolute standard. Thus, there should be a consistent relationship between goals, learning situations and processes, and outcomes of the design. Consequently, design processes are good if designers conduct activities that are aimed at reaching this product consistency. Therefore, the formulation of goals and objectives is regarded as a central activity. In the beginning of the process, time (often extensive) is devoted to exploring and formulating the intended outcomes of the project, which are then translated into concrete product goals and measurable objectives. Thus, problem and needs analyses are done at an early stage of the design process. Later stages are devoted to choosing and designing the means that are necessary to reach these concrete goals and objectives, finally resulting in a blueprint of the product.

According to instrumentalists, reasoning logically and working systematically (from one ADDIE phase to another) are considered essential elements to guaranteeing that the best solution is reached. The goals and objectives that have been formulated during the analysis serve as a reference throughout the entire design process. By establishing project milestones, designers can check whether goals are still being met or whether their strategy needs to be changed. Thus, the primary function of formative evaluation is monitoring, aimed at improving the functionality of the design in relation to the objectives. Box 1 illustrates how the instrumental rationality can be found in the work of Descartes (1930) that is connected with the philosophical tradition of modernism.

Instrumental approaches in design practice. Not only in the literature, but also among practitioners, the instrumental rationality is most often used. In the DATE study (Visscher-Voerman, 1999), 14 out of 24 designers employed an instrumental rationality, with advocates in all six design settings. There seemed to be a direct relationship between the ways these designers thought and worked and the kinds of formal methods they applied. At least 7 of these instrumental designers worked in an organization where standard (instrumental) design procedures have been developed and where designers, in most cases, are expected, or even held accountable, to apply them.

Although designers with an instrumental rationality place great emphasis on the analysis of goals and means to produce good products,

the specific activities they employ can differ in scope and time. Depending on the specific project, these activities can vary, for example, from extensive interviews and observations with potential learners and subject-matter experts, to one short interview with the client. Consequently, it is better not to say that most of the time is devoted to this phase, but rather that considerable weight is attached to the results of the analysis in guiding the remainder of the project. Among the designers in this study, only four conducted a full analysis. The others conducted a restricted analysis as a result of facing time constraints. As soon as they thought they could answer the necessary analysis questions, they quickly moved on to the design phase. Yet they stressed the importance of clarifying the problem and specifications before the design process could start.

In order to work efficiently, instrumental designers strive to get answers to their analysis questions as quickly as possible, but they at least want to have their answers before moving on. They view the formulation of ends as an independent activity that precedes the formulation of means. Following is an example of instrumental thinking and working. This designer reflects on her approach by saying:

> I want to reach effects and that is why I try to clarify in the beginning what the client wants, because that means that I can reach my goal straight away. I am not close-minded: I know that there are many roads leading to Rome, and I don't mind choosing one road above another, but once the client has chosen a road, I want him to stay there.

She would perceive it to be problematic if ideas about the product that were specified in the beginning were to change during the project: "That would mean that I did my analysis poorly. I would think I did not use my checklist well, that I listened poorly."

Instrumental designers translated the design specifications that were based on analysis activities into a concrete product during design and development activities. Although this process was not always followed linearly, designers did not change plans during the project. It was remarkable that instrumental designers integrated fewer evaluation activities during their design activities than other designers did. On the other hand, they more often, and more concisely, evaluated the complete design just prior to or during implementation with users. The primary goal of this evaluation was to assess the extent to which the product was reaching the needs and goals as specified earlier in the analy-

Box 1 ☐ Instrumental rationality within modernism.

Instrumental rationality traces back to modernism, which is still a dominant paradigm in Western scientific thought. In modern thinking it is assumed that by following the strict rules of the natural sciences, truth can be discovered. Descartes, who is considered the father of modernism, introduced the modern, independent subject, who—by thinking rationally—can reveal the evident truths of reality, which is knowable and objective. In *Discours de la methode*, Descartes (1930) formulated four basic rules for a scientific method. According to Descartes, empirical experiments can support the discovery of facts, but the emphasis is on logical reasoning, with a focus on decomposition of problems into simpler ones. Early versions of modernism, like Descartes', hold a strong objectivist conception of reality and knowledge. In contemporary theories of modernism, more contextual and intersubjective notions often replace these objectivist notions (cf. Procee, 1997). The scientific method however, stays more or less the same: Starting from theory, hypotheses are formulated that might solve the problem at hand. By a thorough study the alternatives are generated and weighed. This leads to the knowledge necessary to decide on the best solution. If possible, empirical experiments are conducted for verification. This way of working has many adherents in educational research as well (cf. Schubert, 1986).

Because in modernism the end (the solution to the problem) is defined independently from and prior to the means (the way to solve the problem), this type of reasoning is called end-means rationality. However, many other labels have been used. Proponents of modernism prefer the concept of "scientific rationality." Critics often use the concept of "technical rationality" (Schön, 1987), or "rational rationality" (Self, 1997). Neutral equivalents are *functionalistic*, *procedural*, or *instrumental rationality*.

sis. One of the designers stated that the evaluation phase:

> . . . is the most important activity in the process to check the quality of the design. When a 90% version of the course products has been developed, we conduct a test. The program should be technically stable, so that learners can work with it without any problems. The evaluation result may lead to a revision of the course.

Communicative Paradigm

Many publications acknowledge the influence of social context on design. Authors argue that whenever people are involved, there will be different perceptions and opinions about the problem to be solved and about the product to be made. There are, however, far fewer publications (e.g., Kessels & Plomp, 1997; Schwab, 1970; Walker, 1990) that focus on the communication and negotiation of these perceptions and opinions as the fundamental basis of a design process.

Description of design as a communicative process. From a communicative perspective, a design is good if it meets the standard as discussed and agreed upon by the design team and other stakeholders involved. Acceptable quality is reached when all those involved share this standard. This vision of quality naturally implies that one of the most important aspects of the design process is to conduct activities that are aimed at, and result in, reaching clarity and consensus among stakeholders about the kind of product to be made and how to make it. To reach a shared vision, decisions should be based on deliberation and consensus.

From this point of reasoning, the starting point for the design is not so much an analysis of the existing situation, but the negotiated decisions within the team. Walker's (1990) deliberative approach for generic curriculum development provides a clear example of an approach with a communicative rationality. An essential characteristic of his approach is the acknowledgement that the design product comes into being in a dialogue among team members. Designers formulate a *platform of ideas,* which consists of all relevant topics known to them. These might include a definition of the problem, material constraints, fundamental pedagogical or psychological premises, and a tentative concept of the product and how it might be developed. Designers use this platform of ideas to further communicate conceptualizations of the problem and to discuss or generate alternative versions of materials, while simultaneously assessing the merits of promising early versions and further revising them. McCutcheon (1995) provided an example of solo and group deliberation by teachers, which is based on a communicative rationality. Kessels's (1993) model for the design of corporate training also fits the communicative paradigm well. He stressed the importance of a *relational* design approach as a necessary ingredient of a design process. Frequent communication among team members and other stakeholders is an essential vehicle to reaching consensus as to what the problem is and how it should be solved. Other activities that help shape the relational design approach are project management, function and task analysis, creation of commitment of line management, creation of real-life learning environments, selection and training of trainers, and tryouts with students.

In both Walker's (1990) and Kessels's (1993) models, extensive communication functions as a legitimizing factor for decision making. A consensus approach is seen not only as a mere strategic trick to increase the chance of a successful implementation, but also as necessary for creating a good product. Internal, and especially external, consistency of a product is the basis for determining its quality, rather than its theoretical soundness. Box 2 illustrates how this communicative rationality was described by Habermas (1981), an adherent of critical theory.

Communicative approaches in design practice. As is noted in much of the design literature, most designers acknowledge the importance of clear communication, but far fewer of them deliberately apply an approach that is intended to foster negotiation until decisions can be made based on consensus. In the DATE study (Visscher-Voerman, 1999), the communicative rationality was used by 7 of 24 designers. Most worked in the areas of textbook design, curriculum design, or design of training programs by external agencies. One overall similarity among

the designers in these sectors was that the implementation and (long-term) use of their products was in the hands of others. This may explain the designers' drive to work on external consistency, to increase the chance that the product is implemented and used once it has been completed.

The activities conducted by communicative designers in the DATE study (Visscher-Voerman, 1999) were aimed toward obtaining involvement and commitment from different stakeholders in the process. Therefore, an important reason to conduct analysis activities in the first stage of the project was to have the team and stakeholders specify what they wanted and how it should be made. Task analyses were important vehicles toward this desired outcome. In contrast to designers from other rationalities, communicative designers most often relied on such activities as showing existing materials and previous projects to help clients and stakeholders formulate what *they* viewed as potential solutions. Also the consideration with clients of pitfalls of the potential solution was an important aspect of their analysis. These designers were very particular about involving stakeholders in these analysis activities, either by asking them to provide information, or to codecide what needed to be done. Designs came into being through interaction with, and negotiation among, different stakeholders. Design specifications were sharpened through elaborating different perspectives on the product, the process, and successive versions of the product. These interim products were evaluated formally or informally with stakeholders. The function of those interim evaluations was not only to assess the quality of the product thus far, but also to sharpen product specifications, when stakeholders raised new ideas. Some designers specifically conducted evaluation activities to get stakeholders involved and committed during the process.

Compared to designers with other rationalities, communicative designers more frequently asked stakeholders to codesign. The following quotation illustrates their belief that working together on a product is supposed to yield better results than theoretically perfect products, created solely by the designer.

> I intend to invest more energy in the relation with the client than in the product itself. The internal consistency of a product may be high, but if you forgot to work on the client's acceptation, then the chance on learning effects remains low. . . . I try to create support for the solution by taking some work off the client's hands, but not all, so that they still think it to be their solution. We are responsible together! Therefore, I would, for example, not just make a checklist for them, but would ask and help them to make one, and help them how to use the checklist, and to provide them

Box 2 ☐ Communicative rationality within critical theory.

In the first decades of the 20th century, a Marxist-oriented scientific movement arose, called critical theory. This movement strongly objects to the dominant type of technical reasoning advocated by the modernists. According to critical theorists, one cannot always consider means and ends independently. How is it possible to argue about ethical issues for example, in a technical manner where personal values play no role? Critical theorists argue that truth is not as decontextualized as modernists would like to believe; people always make sense of the world together. They state that philosophers like Descartes have to be aware that their knowledge is never neutral.

The concept of communicative rationality was introduced by Habermas (1981), the most prominent current representative of critical theory. Communicative rationality does not aim at discovering truth but aims at reaching consensus. Communicative acting involves all actions of people aimed at reaching mutual agreement with others on public, social topics (Kunneman & Munnich, 1988). Habermas argued that whereas instrumental rationality might be useful to solve a technical problem, communicative rationality should be used when people are involved. Critical theorists do not deny the possibility of truth, but see truth as an intersubjective notion that is defined by continuous communication. For this communication to be just, everyone concerned should be able to participate in the process, with equal chances and rights. Communication therefore, has a strong legitimizing function. Self (1997) spoke of *critical rationality*, rather than of *communicative rationality*, to highlight the relation to critical theory.

with trust that they can use it well. The spirit of the checklist is more important than the checklist itself.

Pragmatic Paradigm

According to the pragmatic paradigm, products are created through a process of quickly building, testing, and revising several prototypes or early product versions. In this prototyping process, intended users are directly involved in test and analysis activities. The pragmatic paradigm has become especially prominent within the domain of application software design (Connell & Shafer, 1989). More recently, it has influenced the field of educational software, particularly interface design (Hix & Hartson, 1993) and to a limited extent the field of electronic learning materials design (Keursten, 1994; Moonen, 1996). Pragmatic processes are also slowly permeating areas in which computer and multimedia do not play a major role (Wedman & Tessmer, 1993).

Description of design as a pragmatic process. According to advocates of the pragmatic paradigm, designers can only be satisfied with what they make if it works and if it is useful to end users. Thus, a product is good if it has been proven practical and effective with and for users in the specific user context. As a consequence, the basic rationale for the process is that validity, and especially practicality and effectiveness (Nieveen, 1997) can best be determined in practical tests with users. Formative evaluation of several prototypes or interim versions of the product by users, either by discussing them (usually in the beginning of the project) or by trying them out with end users (often later in the project) is a specific characteristic of the process. The use of concrete prototypes is seen as a means to reach a better understanding of the design problem and to identify and create the specifications of the product in interaction with the client, experts, and, most importantly, members of the user population. During successive tryouts, the potential of the product becomes more concrete, helping the designers to make better decisions about improving its quality and product specifications. Since these highly iterative approaches involve creating a prototype early in the process, some authors refer to these processes as rapid prototyping (Rieber, 1994; Tripp & Bichelmeyer, 1990). Others use the term *rapid* to indicate that there will be numerous and tightly scheduled interactive tryouts of multiple and, perhaps, competing designs as part of the process (Connell & Shafer, 1989).

Depending on user satisfaction and available time and finances, the process of design, evaluation, and revision is repeated several times. By extensively testing either "evolutionary" or "throw-away" prototypes (Keursten, 1994; Nieveen, 1997; Wedman & Tessmer, 1993), during the design process, potential implementation failures and system problems will become clear (Gray & Black, 1994; Lantz, 1985; Mauldin, 1995; Moonen, 1996; Porras & Giodano, 1995; Tripp & Bichelmeyer, 1990). These notions reflect the perspective of pragmatism illustrated in Box 3.

Pragmatic approaches in design practice. Pragmatic rationality was clearly evident in only three cases in the DATE study (Visscher-Voerman, 1999). As one might expect, pragmatic rationality was found in the multimedia sector (two designers), involving computer program design. It was more of a surprise to find pragmatic rationality being used by one textbook designer who designed a conglomerate of media, though with a major focus on text. The situations of these three designers were similar in the sense that they all were asked to make an innovative, concrete product with an exemplary function, for which specifications should be found and further developed. This leads to the idea that not only the type of medium, but also the amount of innovation desired might encourage designers to use a pragmatic approach.

Compared to the other designers in the study, pragmatic designers conducted only a restricted analysis, and then went on quickly with design activities. Their analysis activities seemed to be more interwoven with the rest of the design process. They regarded the evaluation of an early prototype as more useful than a lengthy analysis at the beginning of the project. As one designer put it:

In fact, in-between formative evaluations can be more important than a thorough preliminary analysis. Dur-

Box 3 ☐ Pragmatic rationality within pragmatism.

At the end of the 19th century, the sciences were strongly influenced by a new epistemological perspective called pragmatism. In pragmatism, the modernist notion of a knowable, objective reality is not only criticized but also found irrelevant. In fact, pragmatists reject such notions, arguing that we should primarily be concerned with practical instead of theoretical issues. Pragmatists refuse to participate in the ongoing dispute on epistemological assumptions between the modernists and their critics. They argue that people may all see the world differently, but also have to deal with the very same world. So why does an epistemological perspective really matter? Pragmatists call a statement true when it works, when it is experienced to be useful.

Famous pragmatists are James (1907) and, well known in educational sciences, Dewey (1938). Both scientists gave priority to experimental instead of theoretical reasoning. Therefore, this type of rationality is referred to as pragmatic rationality. Coyne (1995), Schubert (1986), and Self (1997) spoke of practical rationality. Recently, scientists such as Putnam (1988) and Rorty (1979, 1991) have injected new life into pragmatism. Putnam (1988), who originates from the natural sciences, claimed that the idea of a coherent theory arrived at by the scientific method is imaginary. Rorty's (1979, 1991) main influence is on the social sciences and social philosophy. He was of the opinion that people can never justify the assumptions of their theories. This, rather relativistic, epistemological position implies that an ultimate foundation of knowledge is impossible, that truth is non-existent.

ing a needs analysis, designers could talk to people and observe them at their current work, but that only provides them with a view of their current situation. It does not say anything about the way in which the product to be designed will add to improving their work. Yet, this can be verified in formative evaluations.

According to pragmatic designers, design specifications become clear by testing interim products or prototypes with their users. In the words of another designer:

> You have to work with prototypes. This is necessary because one cannot define everything in advance. The technology changes quickly and you often know too little about the client and the users to know exactly what the product should look like, based on verbal discussions with them. The use of prototypes enables us to clear up the specifications. Design decisions are mingled and one can only think over design decisions, and decide whether they are useful, once they have been realized and put to work.

Artistic Paradigm

Some authors (e.g., Eisner, 1979, 1996; Schön, 1983) argued that designers' unique expertise and experience are the driving forces while creating designs. According to this view, design decisions are made in direct response to the specific situation in which designers work, and design processes cannot be planned. There is very little specific description of the artistic design process in the education and training literature, although some authors (e.g., Hedberg, Harper, Brown, & Corderoy, 1994; and Henderson, 1998) have talked about being artists rather than instructional designers, and have produced very creative products.

Description of design as an artistic process. The basic assumption underlying the artistic paradigm is that individuals construct their own reality. Reality, thus, is subjective, and liable to many different perspectives. Designers are considered artists who choose among an almost unlimited variety of ways of representing their views of reality (Marsh & Willis, 1995). Therefore, the rationality underlying this paradigm is called artistic, which has a basis in postmodernism (see Box 4). As a consequence, it is mainly designers' subjective criteria that judge a product as good.

Designers with an artistic rationality construct design problems and solutions in their own unique way. Because of their repertoire, such designers are likely to focus on some features of design situations while neglecting others. They conceptualize the situation into one they understand from their own professional background. Like artists in other fields, artistic education and training designers make certain moves and immediately judge these moves. According to Schön (1987), designers evaluate their moves in a threefold way. First, based on

categories drawn from normative design domains, they judge how desirable the consequences of their moves are. Second, they judge the extent to which their current moves conform to earlier moves, or violate the implications set up by earlier moves. Third, they estimate how much they appreciate the new problems or potentials the current move has created. Eisner's (1979) description of the connoisseurship approach resembles this description. When applying the artistic approach, designers first render the qualities perceived in the situation, either in a formal or informal evaluation. Then they try to interpret and understand what they have rendered, by using, among other things, ideas, concepts, models, and theories from the social sciences and from history. Also, they assess the educational importance or significance of the events or objects described or interpreted.

Means and ends are framed interdependently in the problem situation. After a lead time in which the idea for a product matures, designers conceptualize this idea into a product. They may test their own ideas by talking about them with others or by showing them and observing their reactions. However, the norms and values of the designer play a decisive role in decision making about the product. Artistry is the basis for bringing a design into being. Fundamental notions from the artistic perspective are illustrated in Box 4.

Artistic approaches in design practice. None of the designers interviewed in the DATE study (Visscher-Voerman, 1999) were classified as having demonstrated primarily an artistic rationality in their projects. Two possible explanations are offered for the lack of artistic rationality in the data. First, although it was examined for empirical evidence, the framework was primarily a theoretical construct derived from the literature. Since the rationality of designers was not a purposive criterion for selecting designers for the DATE study, we cannot generalize about the absence or presence of artistic rationality in practice. Second, instructional designers usually operate in a social context while working for a paying client who will hold them responsible for what they are doing. Clients and stakeholders increasingly want a say in the process and the product and, thus, can force designers to moderate their own demands and aesthetic values in order to stay competitive. It may be that there are fewer artistic designers in practice than, for example, instrumental or communicative designers, because of the influence of paying clients on the choice of a design paradigm. If this is true, it is not surprising that none were found in a sample of only 24 designers, all of whom worked for paying clients.

Conclusion

In this last section of this article, we focus pri-

Box 4 ☐ Artistic rationality and postmodernism.

A fairly new movement in contemporary thinking is postmodernism. Postmodernists are of the opinion that Western scientific thought is flawed with its emphasis on sameness. By trying to discover the ultimate theory and the one-and-only truth, the sciences reduce reality to one view and truth to one foundation. Postmodernists will never stop pointing at the underlying assumptions of established scientific methods. In their opinion, scientific thought has inherited the dichotomous thinking of the Cartesian ego that allowed only the mind, and not the body, in the sciences. Why mind and no body, why rational thinking and no creativity, why singularity and no plurality, why abstract and not concrete, why thinking and no feeling? Modernists perceive them as opposites; postmodernists think they are not.

A well-known postmodern strategy is deconstruction, introduced by Jacques Derrida (e.g., Derrida & Attridge, 1992). Deconstruction originates from literature criticism and denies the existence of one meaning of a text. Instead of focusing on the explicit message of a text, the deconstructionist focuses on its hidden assumptions. By uncovering the things not said, meaning is constantly changed. Because postmodernists try to dissolve the borders between the domains of the sciences and the arts, their type of rationality can be called artistic.

marily on the framework of the four paradigms presented. The framework reveals some of the fundamentally different ways in which designers view the world and how they engage in the design of instructional products. The four paradigms are not completely mutually exclusive. That is, to some extent, several activities associated with each paradigm are present, at least to some degree, in each of the other paradigms. But although these activities may be present in several paradigms, their function and use can be very different in each. For example, designers who work for clients will communicate with them about the product to be made, but that does not make them communicative designers in the sense described here. Similarly, although a designer may work with several prototypes, this does not make him or her a pragmatic designer by our definition. And the same can be said for creativity; one hopes it is present in any project and is not the exclusive domain of the artistic designer.

The framework displays how designers from different paradigms have different perceptions of what they regard as good products and as good processes. Consequently, they put different emphases on the role and function of each of the ADDIE activities, and they conduct these activities at different times in the process. The typical purpose of each ADDIE activity, as a consequence of a designer's rationality, is summarized in Table 1. The concept of rationality, being related to one's individual set of beliefs, illustrates that design approaches are personal, and are dictated by individual preferences. The specific design settings as specified at the start of the research do not seem to have an explicit influence on the paradigm used, except in the design setting, Design of training and human resource development programs in external bureaus, where all designers used a communicative approach. Within the other settings, two of three of the paradigms were found.

Although designers with *different* rationalities differ in what they perceive as good products and good design processes, and differ in the way they conduct the process, this does not imply that designers with the *same* rationalities are all alike in how they shape the process. We think that the remark that all design processes differ from each other and that each process is unique (e.g., Wedman & Tessmer, 1993) still holds. The data give us reason to believe that even designers with the same rationality vary in how they conduct the process. The differences within a paradigm are, however, more on a tactics level than on a general design level, and can likely be attributed to variables in the specific project context, such as available resources, number and kinds of stakeholders working together, or attitude of the client.

Designers are increasingly aware that they make products for people and with people and that, by their products, they may change people. Thus, clients and other stakeholders are increasingly committed not only to the product, but also to the process. Several of the ADDIE activities also can be used to support the social-dynamic interaction processes during a design project. Instrumental designers, for example, may use their project management techniques to communicate their plans to clients and to gain their approval. Attention to the social aspect (by itself) is obvious in communicative and pragmatic processes, where stakeholders and users are given a major voice in the decision-making process and are asked to think through or maybe even work on the product. Formative evaluation may be deliberately conducted to stimulate communication and collaboration among stakeholders, to involve them in the process. In the artistic approach, a shift is made away from objectivistic and technical reasoning toward the unique experience and ability of the designer. The designers interviewed in the DATE study (Visscher-Voerman, 1999) were all aware of the social dimension of design, but made different efforts with respect to how explicitly and purposively they conducted activities from a socio-professional perspective. Consequently, they have different views on their own roles in a design process and on the roles of their clients and other stakeholders (see Table 2).

DISCUSSION AND IMPLICATIONS

This article presented four design paradigms and their underlying rationality: (a) instrumental, (b) communicative, (c) pragmatic, and (d) artistic. The framework was developed to help

Table 1 ☐ Paradigms and rationalities related to analysis, design and development, implementation, and evaluation (ADDIE) activities.

Instrumental	*Communicative*	*Pragmatic*	*Artistic*
Analysis			
• to specify measurable goals • in beginning of process	• to reach negotiated goals • in "platform" phase and along the way	• to clarify problem and specifications with users • through evaluations of prototypes	• to clarify problem and specifications • continuously integrated in connoisseurship
Design and Development			
• design specifications are result of analysis phase • prototype resembles final product as much as possible	• design specifications are result of stakeholder deliberation • prototype can be existing material or new idea or perspective	• design specifications are developed through evaluating prototypes • prototypes might even be discarded	• design specifications are drawn from designer's insights • product gradually takes form as in a painting
Implementation			
• through design of quality materials, incorporating users' needs	• through providing stakeholder role in design and evaluation process	• through providing users with opportunity to evaluate product	• through testing ideas on users to see if they are reaching them
Evaluation			
• to assess product quality against absolute standard; • to confirm that product works and to detect any bugs to be repaired	• to assess product quality against standard as negotiated • to support deliberation	• to assess product quality against practical standard • to specify further design requirements	• to assess product quality against standard of connoisseurship

structure and underpin the wide variety across designers and projects with respect to the way in which ADDIE activities are conducted. Different rationalities reflect designers' specific stances toward what constitutes a good design and good designing. Designers from different paradigms possess different conceptions of what they consider to be a good design and a good design process. They also differ in how they conduct design processes, and they have different reasons for why they are doing so. Their actions are based on different theories and epistemological viewpoints, which provides insight into the strategies that designers utilize. As Willis (1998) stated, "Simply put, we cannot understand why there is strong disagreement on some issues related to ID [instructional design] unless we understand the theoretical and epistemological framework being used by proponents of different viewpoints" (p.15).

For three of the paradigms, illustrations were provided of how rationality may permeate design processes in practice. We concluded that designers working within these three different rationalities do act differently. At the same time, it turned out that in some instances similar activities were conducted for different reasons. Especially, designers with a communicative and pragmatic rationality tended to conduct activities that resembled those from other paradigms, such as the elaboration of one or more prototypes. But their reasons differ (see also Willis, 1998, p.8). Thus, the concept of rationality can help explain at least part of the similarity, as well as the differences, in approaches that designers apply in their projects.

The concept of rationality, if developed further, may help designers to become more conscious of differences between approaches, and of typical activities within those approaches. It may help them to reflect on their own work, and to guide them in choosing their own style. Toward that aim, an overview of potential strengths and limitations of each rationality and

Table 2 ☐ The perceived roles of designers and clients in the four design paradigms.

	Role of		
Instrumental	*Communicative*	*Pragmatic*	*Artistic*
Designer			
• expert, using expert knowledge to develop product • responsible for design	• facilitator, helping clients specify needs and develop product • shared responsibility with client	• expert, relying on input from users • responsible for design	• artist, using own subjective, unique knowledge and reflection • fully responsible
Client			
• provider of information and approval for action	• provider of information • codesigner or codecider	• user of product and provider of information	• user of product, may or may not be consulted

paradigm is provided in Table 3. The strengths and limitations were specified by judging a paradigm from standpoints both within and outside that paradigm.

The instrumental paradigm has been dominant in instructional design literature. According to those who adhere to traditional design thinking, this paradigm should remain dominant. In their view, while planning their design approach, designers should pick the instrumental approach as a first option. For example, within the field of instructional design, Braden (1996) argued that:

> Linear instructional design and development is not the answer to every performance problem. It is not even the answer to every instructional design problem. It is, however, the best, most effective, most efficient procedure for designing instruction that is meant to teach specific things at most knowledge levels. The IDD process ought to be the first procedure considered to be adopted if appropriate and discarded only with caution (p. 21).

The DATE study (Visscher-Voerman, 1999) showed that, among the designers interviewed, the instrumental paradigm was applied most often, and in a range of different design situations. Half of the designers interviewed applied an instrumental approach in their projects, though often prompted by the obligatory use of certain design procedures in their organizations. Several designers referred to the instrumental approach as the best or standard approach. However, both our data and the literature indicate that approaches from other paradigms are increasingly being used and that the interest in these approaches will likely continue to grow in the future. This finding seems to support the concerns expressed earlier in literature, provided by, for example, Gustafson (1993) and Richey (1993), who raised questions about the relevance of the instrumental paradigm for many design contexts; especially given recent epistemological and technical developments. They guessed that, especially in those cases where goals cannot be formulated at the start of the process, designers are likely to resort to other approaches from other design paradigms, because the means-end thinking of the instrumental approach seems to fail. Although the interest in different paradigms, such as the communicative and pragmatic paradigms, may grow, this should not be seen as a plea to discard the instrumental paradigm. Rather, it is a caution not to consider instrumentalism as a goal per se.

Since rationality explains at least part of the variety of design approaches, it could help designers to gain understanding of different styles exhibited by others. Rationality may explain why some people work well together and why others do not. What happens if rationalities from team members and clients differ from each other? In fact, in their choice for a design approach, designers might be guided not only by their own preferences and the kind of product to make, but also by the viewpoints of clients, users, and other stakeholders in the process. Dills and Romiszowski (1997) foresaw a growing role for stakeholders in the process. Willis (1998) suggested that designers:

Table 3 □ Strengths and limitations of the paradigms.

Instrumental	*Communicative*	*Pragmatic*	*Artistic*
Strengths			
• provides planning and tracking mechanism • provides useful communication tool • facilitates documentation based on planning • makes process teachable • leads to measurable effects and to internally consistent products	• asks for input from stakeholders • builds ownership • acknowledges presence of different perspectives about problem and solution • helps to create shared design specifications • leads to externally consistent products	• may lead to quicker results for lower costs • may be efficient • helps to create design specifications • leads to products that are matched to user needs	• designer does not restrict solution space • may lead to unique and creative products
Limitations			
• goals cannot always easily be described at the start of a project • ignores fact that goals may change during project • may be inefficient • product may not meet end-users' real needs	• may lead to designs that are not theoretically sound • may lead to difficult communication • requires skills from designers to prevent endless discussions • asks much time investment from stakeholders • difficulty in determining who should be given a say in the product	• obscures planning and management of process • potential risk of conflicting opinions between user and client • may be inefficient, because of trial and error • may result in endless revision, when listening too much to users • hinders measurement of effects because of absence of clear starting points	• obscures planning and management of process • involves risk of focusing too much on designer's own ideas, neglecting wishes and needs from stakeholders and end-users • process cannot be articulated, and, thus, is hard to teach or document

Do ID within your own paradigm but remain open to methods and results from other paradigms. Make an effort to understand what others are saying and be willing to change your paradigm, or even give it up for another, if proponents of opposing views can convince you that they have merit (p. 16).

Because rationality was judged to depend partly on the personal preferences of the designer, one could wonder whether designers would be able to deliberately shift paradigms. Unfamiliarity with the concept, lack of skills, or the need to rely on one's own clear style, all may be reasons for designers to continue working within one paradigm or rationality. Yet, different circumstances will likely call for different design approaches, and, especially, those who work across different contexts could be well served by choosing the approach that is most appropriate.

Ultimately, we believe that *all* of the paradigms and their accompanying perspectives, tools, and techniques can and do play useful roles in designing effective, efficient, relevant, and engaging instructional experiences. We believe that all practicing professionals should be aware of the value of each paradigm, and use the one that is most appropriate for the specific situation. To do less is to be less than a complete and competent practitioner. Against the background of continuous curriculum renewal, it is not only likely, but also desirable that designers will rely on alternative paradigms. In fact, it could be argued that a characteristic of competent professionals is their ability to adapt to different styles, and to act as "chameleons" (Visscher & Rip, 1999), deliberately choosing a style that is best for the situation.

It also is clear that additional field-based research on how design practice actually takes place would benefit both theorists and practitioners. We think the framework presented in this article provides a useful structure for some of that research. □

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REFERENCES

Andrews, D.H., & Goodson, L.A. (1991). A comparative analysis of models of instructional design. In G.J. Anglin (Ed.), *Instructional technology: Past, present and future* (pp. 133–155). Englewood Cliffs, CO: Libraries unlimited.

Bobbitt, F. (1924). *How to make a curriculum.* Boston, MA: Mifflin Company.

Braden, R.A. (1996). The case for linear instructional design and development: A commentary on models, challenges, and myths. *Educational Technology, 36*(2), 5–23.

Connell, J., & Shafer, L. (1989). Structured rapid prototyping: An evolutionary approach to software development. Englewood Cliffs, NJ: Yourdan Press.

Coyne, R. (1995). *Designing information technology in the postmodern age.* Cambridge, MA: MIT Press.

Derrida, J., & Attridge, D. (1992). *Acts of literature.* New York, NY: Routledge.

Descartes, R. (1930). *Discours de la methode* (2nd ed.). Paris, France: Vrin.

Dewey, J. (1938). *Logic: The theory of inquiry.* New York: Henry Holt and Company.

Dick, W., & Carey, L. (1996). *The systematic design of instruction* (4th ed.). New York: Harper Collins College Publishers.

Dills, C.R., & Romiszowksi, A.J. (1997). The instructional development paradigms: An introduction. In C.R. Dills & A.J. Romiszowski (Eds.), *Instructional development paradigms* (pp. 5–30). Englewood cliffs, NJ: Educational Technology Publications.

Eisner, E.W. (1979). *The educational imagination: On the design and evaluation of school programs.* New York: Macmillan.

Eisner, E.W. (1996). *The educational imagination: On the design and evaluation of school programs* (2nd ed.). New York: Macmillan.

Feteris, A. (1992). Ideeën voor het genereren van alternatieven [Ideas for the generation of alternative solutions]. In Tj. Plomp, A. Feteris, J.M. Pieters, & W. Tomic (Eds.), *Ontwerpen van onderwijs en trainingen* (pp. 171–193). Utrecht, Netherlands: Lemma.

Gagné, R., Briggs, L., & Wager, W. (1992). *Principles of instructional design* (4th ed.). New York: Holt, Rinehart, and Winston.

Gerlach, V.S., & Ely, D.P. (1980). *Teaching and media: A systematic approach* (2nd ed.). Englewood Cliffs, NJ: Prentice Hall.

Gray, D.E., & Black, T.R. (1994). Prototyping of computer-based training materials. *Computers in Education, 22*(3), 251–256.

Gustafson, K. (1993). Instructional design fundamentals: Clouds on the horizon. *Educational Technology, 33*(2), 27–32.

Gustafson, K., & Branch, R. (2002). *Survey of instructional development models* (4th ed.). Syracuse, NY: Syracuse University, ERIC Clearinghouse on Information Resources.

Habermas, J. (1981). *Theorie des kommunikativen Handelns* [Theory of communicative action]. Frankfurt am Main, Germany: Suhrkamp.

Hedberg, J., Harper, B., Brown, C., & Corderoy, R. (1994). Exploring user interfaces to improve outcomes. In K. Beatie, C. McNaught, & S. Wills (Eds.), *Interactive Multimedia in University Education: Designing for Change in Teaching and Learning (pp. 15–29).* Amsterdam: Elsevier.

Henderson, J. V. (1998). Comprehensive, technology-based clinical education: The virtual practicum. *International Journal of Psychiatry in Medicine,* 28(1), 41–79.

Hix, D., & Hartson, H. (1993). *Developing user interfaces: Ensuring usability through product and process.* New York: John Wiley & Sons.

James, W. (1907). *Pragmatism: A new name for some old ways of thinking: Popular lectures on philosophy.* New York: Longmans, Green.

Johnson, J.C. (1990). *Selecting ethnographic informants.* Qualitative research methods series, 22. Newbury Park: Sage.

Kessels, J.W.M. (1993). *Towards design standards for curriculum consistency in corporate education.* Doctoral dissertation, University of Twente, Enschede, the Netherlands.

Kessels, J.W.M., & Plomp, Tj. (1997). The importance of relational aspects in the systems approach. In A.J. Romiszowski & C.R. Dills (Eds.), *Instructional development paradigms* (pp. 93–126). Englewood Cliffs, NJ: Educational Technology Publications.

Keursten, P. (1994). *Courseware-ontwikkeling met het oog op implementatie: de docent centraal* [Courseware development from an implementation perspective: Focus on the teacher]. Doctoral dissertation, University of Twente, Enschede, the Netherlands.

Kunneman, H., & Munnichs, G.M. (1988). Jürgen Habermas. In H.J. Achterhuis, J.S. Weiland, S.E. Teppema, & J. de Visscher (Eds.), *Kritisch denkerslexicon, 25* (pp. 1–17). Samson: Alphen aan de Rijn.

Lantz, K.E. (1985). *The prototyping methodology.* Englewood Cliffs, NJ: Prentice-Hall.

Marsh, C., & Willis, G. (1995). *Curriculum: Alternative approaches, ongoing issues.* Englewood Cliffs, NJ: Merrill.

Mauldin, M. (1995). Developing multimedia: A method to the madness. *THE Journal, 22*(7), 88–90.

McCutcheon, G. (1995). *Developing the curriculum: Solo and group deliberation.* White Plains, NY: Longman.

Merriam, S.B. (1988). *Case study research in education: A qualitative approach.* San Francisco, CA: Jossey Bass.

Miles, M.B., & Huberman, A.M. (1994). *Qualitative data analysis: An expanded sourcebook* (2nd ed.). Thousand Oaks: Sage.

Moonen, J.C.M.M. (1996). Prototyping as a design method. In Tj. Plomp & D.P. Ely (Eds.), *International Encyclopedia of Educational Technology* (2nd ed., pp. 186–190). Cambridge: Pergamon.

Morrison, S., Ross, G., & Kemp. J. (2001). *Designing effective instruction.* New York: John Wiley & Sons.

Nieveen, N.M. (1997). *Computer support for curriculum developers: A study on the potential of computer support in the domain of formative curriculum evaluation.* Doctoral dissertation, University of Twente, Enschede, the Netherlands.

Plomp, Tj. (1982). *Onderwijskundige technologie: Enige verkenningen.* [Educational technology: Several explorations]. Enschede, the Netherlands, University of Twente, Faculty of Educational Sciences and technology.

Porras, L.H., & Giodano, D. (1995). Developing hypermedia with a rapid prototyping approach: A case study. *British Journal of Educational Technology, 26*(1), 59–61.

Posner, G.J., & Rudnitsky, A.N. (2000). *Course design: A guide to curriculum development for teachers (*6th ed.*).* New York: Longman.

Putnam, H. (1988). *Representation and reality.* Cambridge, MA: MIT Press.

Procee, H. (1997). *De nieuwe ingenieur: Over techniekfilosofie en professioneel handelen* [The new engineer: About philosophy of technology and professional action]. Amsterdam: Boom.

Reiser, R., & Dick, W. (1996). *Instructional planning: A guide for teachers* (2nd ed.). Boston: Allyn and Bacon.

Richey, R.C. (1993). Instructional design in a changing field. *Educational Technology, 33*(2), 16–21.

Richey, R.C., Klein, J.D., & Nelson, W.A. (2003). Developmental research: Studies of instructional design and development. In D.H Jonassen (Ed.), *Handbook of Research for Educational Communications and Technology: A Project of the Association for Educational Communications and Technology* (2nd ed.) (pp. 1099–1130). Hillsdale: Lawrence Erlbaum.

Rieber, L.P. (1994). *Computers, graphics, and learning.* Dubuque, IA: Brown and Benchmark.

Romiszowksi, A.J. (1981). *Designing instructional systems: Decision making in course planning and curriculum design.* London: Kogan Page.

Rorty, R. (1979). *Philosophy and the mirror of nature.* Princeton, NJ: Princeton University Press.

Rorty, R. (1991). *Objectivity, relativism, and truth.* Cambridge: Cambridge University Press.

Rowland, G. (1992). What do instructional designers actually do? An initial investigation of expert practice. *Performance Improvement Quarterly, 5*(2), 30–45.

Schön, D.A. (1983). *The reflective practitioner: How professionals think in action.* New York: Basic Books.

Schön, D.A. (1987). *Educating the reflective practitioner: Toward a new design for teaching and learning in the professions.* San Francisco: Jossey-Bass.

Schubert, W.H. (1986*). Curriculum: Perspective, paradigm, and possibility.* New York: MacMillan.

Schwab, J.J. (1970). *The practical: A language for curriculum.* Washington DC: National Education Association.

Self, J.A. (1997). From constructionism to deconstructionism: Anticipating trends in educational styles. *European Journal of Engineering Education, 22*(3), 295–307.

Smith, P.L., & Ragan, T.J. (1999). *Instructional design.* New York, NY: Wiley.

Tessmer, M. (1994). Formative evaluation alternatives. *Performance Improvement Quarterly, 7*(1) 3–18.

Tripp, S.D., & Bichelmeyer, B. (1990). Rapid prototyping: An alternative instructional design strategy. *Educational Technology and Development, 38*(1), 31–44.

Tyler, R.W. (1949). *Basic principles of curriculum and instruction.* Chicago: The University of Chicago Press.

Van den Akker, J. (1999). Principles and methods of development research. In J. van den Akker, R.M. Branch, K. Gustafson, N. Nieveen, & Tj. Plomp (Eds.), *Design Approaches and Tools in Education and Training* (pp.1–14). Dordrecht, Netherlands: Kluwer.

Van de Wolde, J. (1992). Het algemeen model voor systematische probleemoplossing [The generic model for systematic problem solving]. In Tj. Plomp, A. Feteris, J.M. Pieters, & W. Tomic (Eds.), *Ontwerpen van onderwijs en trainingen* (pp. 65–87). Utrecht: Lemma.

Visscher, K., & Rip, A. (1999). Organisatie-adviseurs en de illusie van "agency" [Management consultants and the illusion of agency]. *Management en Organisatie, 53*(1), 24–35.

Visscher-Voerman, J.I.A. (1999). *Design Approaches in Training and Education: A reconstructive study.* Doctoral dissertation, University of Twente, Enschede, the Netherlands.

Visscher, I., & Schulten, E. (1997). *Design approaches in training and education: Insights from practice.* Paper presented at the Annual Meeting of the AERA, Chicago.

Vos, H.J. (1992). Het kiezen van een oplossing [Choosing a solution]. In Tj. Plomp, A. Feteris, J.M. Pieters, & W. Tomic (Eds.), *Ontwerpen van onderwijs en trainingen* (pp. 195–220). Utrecht, Netherlands: Lemma.

Walker, D. (1990). *Fundamentals of curriculum.* Fort Worth: Harcourt Brace College.

Wedman, J., & Tessmer, M. (1993). Instructional designers' decisions and priorities: A survey of design practice. *Performance Improvement Quarterly, 6*(2), 43–57.

Willis, J. (1998). Alternative instructional paradigms: What's worth discussing and what isn't? *Educational Technology, 38*(3), 5–16.