# SIMULATION MODELS AND PARTICIPATION: DESIGNERS AND "CLIENTS"

Rachel Kaplan, University of Michigan, Ann Arbor, Michigan

## ABSTRACT

User participation in environmental design can be substantially enhanced by the use of physical models of the to-be-changed environment. A major impediment, however, appears to be their high cost. Simple models would provide an ideal solution if indeed they could be properly interpreted by designer and client alike. The purpose of the study was to test the interpretation of physical models differing with respect to building articulation and site rendition by individuals differing in design backgrounds.

Model articulation was important but neither the preference nor adequacy judgments were influenced by either group. For the architecture students, by contrast, articulation dominated preference judgments. The site with the superior architecture, when represented by a high articulation model, was preferred regardless of function. Only the landscape architects, interpreted the contour-layered site presentation as representing continuous elevation differences.

In general this study supports the use of simple models.

# MAQUETTES DE SIMULATION ET PARTICIPATION : DESIGNERS ET "CLIENTS"

Rachel Kaplan, University of Michigan, Ann Arbor, Michigan

## RÉSUMÉ

La participation des utilisateurs à l'aménagement de leur environnement peut être fortement stimulée par l'utilisation de maquettes des sites à modifier. Toutefois, le coût élevé de celles-ci s'avère un obstacle d'envergure. Des maquettes simples pourraient être la solution idéale si elles pouvaient être interprétées adéquatement par le designer et son client. La présente étude avait pour objet de tester, auprès de personnes ayant des formations différentes en aménagement, l'interprétation de maquettes différentes du point de vue de l'articulation des immeubles et du rendu du site.

L'articulation des maquettes a été un facteur important. Ni les préférences ni les points de vue sur le caractère adéquat n'ont été influencés par l'articulation des maquettes, un groupe ou l'autre. Par contre, dans le groupe des étudiants en architecture, l'articulation a prévalu dans la formulation de leur choix. Leur préférence s'est arrêtée sur la maquette très articulée représentant une architecture supérieure, sans tenir compte de la fonction. Seuls les architectes-paysagistes ont trouvé que la présentation avec contours et niveaux reproduisait des différences continues d'élévation.

D'une façon générale, cette étude appuie l'utilisation de maquettes simples.

## INTRODUCTION

A "visionary" is one who can see what does not yet exist. Planning and environmental design involve such not-yet-existing situations and, therefore, call for the ability to envision. It can hardly be assumed, however, that people, in general, share this ability to "see" what is not yet to be seen. Public participation in environmental design decisions thus benefits greatly from the provision of visual information.

Physical models can be very helpful for such visions. In fact, they have been found to be effective tools in many instances of participatory design in many cultures, both literate (e.g., Carpman, Grant & Simmons, 1986; Kaplan & Kaplan, 1982; Lawrence, 1982) and less literate (e.g., Hardie, 1983; Stea, 1984). Yet despite their effectiveness, physical models have not been widely used in the participation process. Perhaps one reason for this is the concern for cost (Appleyard, 1977). If one seeks public input early in the process, when the design is not yet well established, creating costly models would be foolish. An important question, then, concerns the usefulness of less costly models as a tool in participation.

While the idea of using models that are relatively simple, and hence, less costly, would seem to be a promising approach, certain reservations would have to be put to rest before this potential can be considered to be empirically justified. In particular, designers seem to have a great fondness for models that are beautiful and, unfortunately, expensive (Burden, 1970; Hohauser, 1970). Designers have also expressed doubt about the appropriateness of using simple models as a context for interacting with clients. This feeling may reflect the concern that the public may not adequately comprehend or appreciate the proposed design when expressed in that way (Appleyard, 1977). Alternatively it may reflect the designer's own discomfort with simple models. This would seem less likely since such models are often used for in-house purposes.

Whatever the true picture, there are both theoretical (S. Kaplan, 1977) and empirical (e.g., Grant, 1979; R. Kaplan, 1973) grounds to support the notion that substantial differences exist between designers and the public in both perception and preference. It thus seems advisable to test these issues directly before coming to any conclusion as to how either group is likely to react to a design depicted through the use of simple models.

The purpose of this paper, then, is to present portions of a study that explored some of these issues.[1] The focus here is on comparisons between individuals who differ with respect to design training. If designers and clients are to work together in early phases of site development it is important that both sides can understand low-cost simulations of the project. Would either side draw very different inferences about the site if they were provided with more traditional finished models than with less detailed ones?

## METHODS

**Sites.** Two apartment complexes were used. Each site consisted of five buildings which varied considerably in size. Both sites were similar in having paved walkways and large grassy areas, limiting vehicular traffic to the perimeter, and in the use of balconies. Site 100 was 1.3 ha in size, with 2-story brick and wood buildings averaging about 12 units per building. The buildings are architecturally interesting, featuring sloping rooflines at different angles and various other design features that make the site noteworthy. In addition, the units were built without removing the large and varied trees on the site. Site 200, about 2.1 ha consisted of 2- and 3-story buildings with brick facade, averaging 19 units per building. The trees were planted after the buildings were completed and are much smaller.

**Building models.** For each of the two sites, two sets of models were constructed at a scale of 1.6 mm = 30.5 cm (1/16 inch = 1 foot). The models were between 3.8 and 5.1 cm in height and varied in size (cm) from 13.3 x 16.5 to 13.3 x 31.8 at Site 100 and from 11.4 x 17.8 to 11.4 x 38.7 at Site 200. All models were constructed from the architectural specifications used in the

---

The study was carried out in collaboration with S. Kaplan and H. L. Deardorff and would not have happened without their enthusiasm and insight. The Institute for Environmental Quality, University of Michigan, provided partial support for the project.

[1] Other portions of the study addressed the relation between models and the actual site as well as the use of models for presenting alternative site arrangements.

original site construction. The high articulation models for each site were made of hand cut basswood with black acetate windows and doors and accurate representation of design features. The low articulation models were made of solid pine blocks. Only the outline shape of the building was represented by these; windows and doorways were not included. Charcoal gray heavy paper was pasted on the roofs to represent the dark top views of the actual buildings.

**Site renditions.** For each of the two sites, two methods of representing the site were used. The contour rendition involved 1.6 mm chipboard layers to represent each foot of elevation. These accurately reflected the location of each building with respect to its surrounding terrain. Walkways were represented in darker gray. The flat rendition consisted of chalk drawing on vellum, fixed to board. The grass area was in charcoal, parking areas in light gray, and walkways were left white.

Landscape features for both sites and both renditions consisted of trees made of dried yarrow plants with the ends removed to simulate the winter appearance of the trees. The trees were located as indicated in the site plans used in the original construction. Cars made to scale were arranged in parking areas and along the roadways adjoining the sites.

**Viewing angles.** Black and white photographs were taken both at eye-level and from an oblique angle (approximately 30 degrees). Eye-level photographs were taken with the camera in the same plane as the models. A plain background and undramatic lighting were employed to simulate an overcast day. The photographs were taken to provide a broad sample of the possible directions for viewing the site. The oblique views included several in which at least part of each of the five buildings could be seen and others in which only part of the complex was visible. The eye-level scenes characteristically were based on a view through the corridor defined by a pair of buildings.

**Design of the study.** The "high articulation" models were photographed with both the contour and flat site renditions, while the "low articulation" models were used only with the flat rendition. Each of these three versions was photographed at eye level and from the oblique angle. This then constituted the six conditions, differing in viewing angle, model articulation, and site rendition, to which participants were randomly assigned.

For each of these combinations, and for each site, seven photographs were used to represent the site. (See Figure 1 for two examples of each of these sets.) These were matched to show as closely as possible the same views in all eye-level and in all oblique situations. The sets of seven 8.9 x 12.7 cm photographs were mounted on 33 x 43 cm boards, covered with clear vinyl. The order of presentation for the two sites was counterbalanced.

**Task booklet.** Along with the boards showing the site (in each condition), the participant was given a booklet which explained the task as involving exterior arrangements of apartment house complexes. The booklet also contained questions, generally requesting a rating (6-point scale), but also permitting room for additional comments. The questions were divided into three categories: Adequacy of the site (walkways, space for children's play, visual privacy, shared outdoor spaces, avoiding a crowded appearance, ease of finding a particular apartment, overall spatial organization); Preference (appearance of space between buildings, appearance of spacae within complex, architecture of buildings, overall appearance, overall evaluation as a place to live, and as a place for families with children); and Method of presentation (overall layout, arrangement of paths, terrain or slope, architecture, how it would feel to be there, and overall evaluation of presentation method).

**The Samples.** Three groups participated in the study. While all participants were students, they differed with respect to their training in design-related areas. The group with no such training, approximating a client group, consisted of 138 students enrolled in an introductory psychology course. The architecture students (N=37) were advanced students in the 6-year program. The 24 landscape architecture students were either in their second or third year of the 3-year program. For this sample only the oblique viewing angle conditions were used.

## RESULTS AND DISCUSSION

The focus of the results presented here is on comparisons between the three samples. These comparisons are based on analyses of variance and *t*-tests. Only results significant at $p<.05$ are included. (Because of space limitations, results based on viewing angle are not included here.)

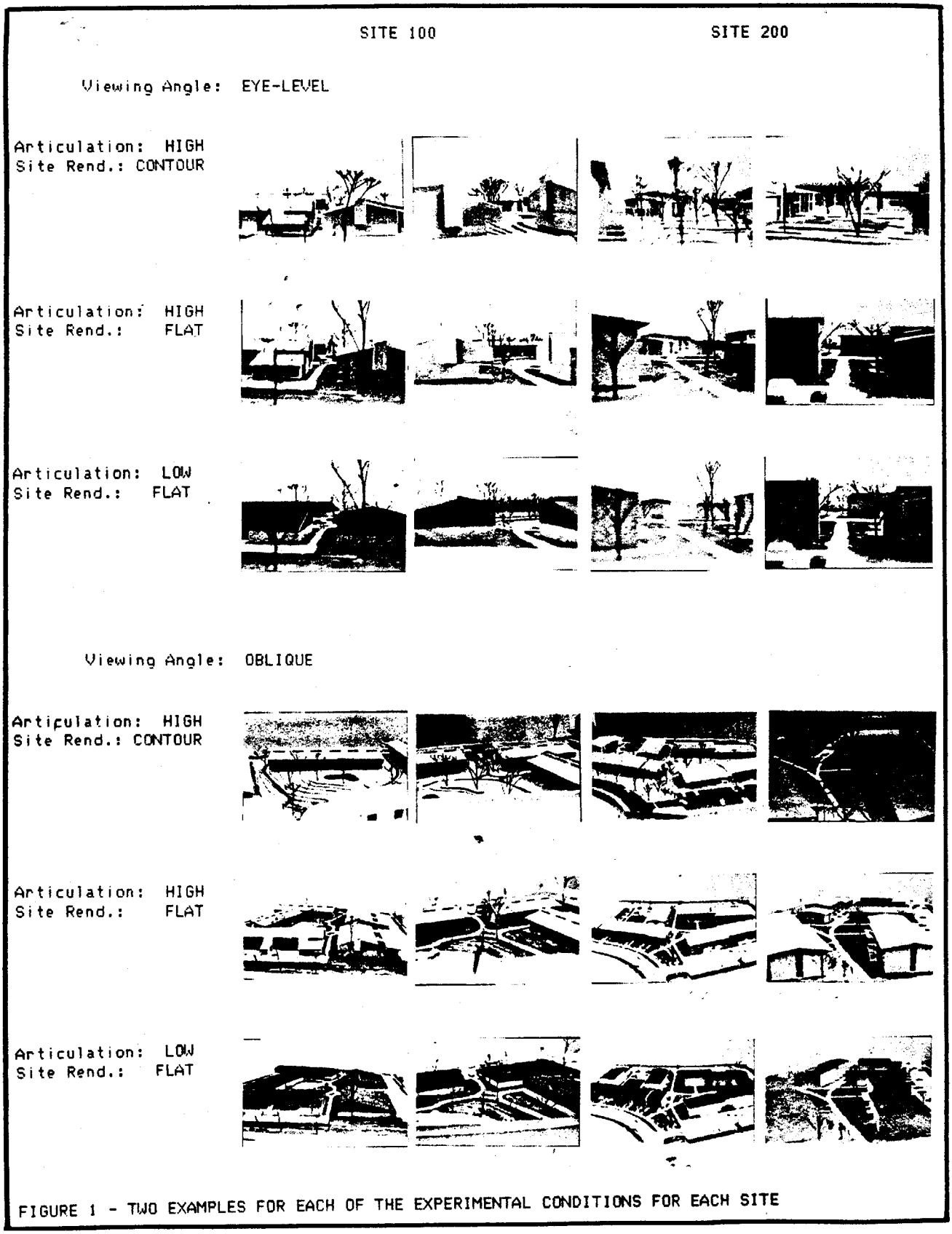


FIGURE 1 - TWO EXAMPLES FOR EACH OF THE EXPERIMENTAL CONDITIONS FOR EACH SITE

**Articulation.** The presentation of architecture was rated more favorably when the models showed greater articulation, for all samples. For the architecturally more interesting site (100), the architecture was also preferred by participants in all three samples who saw "high articulation" versions. It is clear that viewing models with greater architectural detail affects judgments related to architecture. For the "client" sample the articulation had no bearing on other judgments.

For the architecture students, by contrast, the high articulation models (holding site rendition constant, and combining across viewing angles) were rated as preferred with respect to <u>each</u> preference item at Site 100. In other words, for the architecturally more interesting site and with photographs that show more architectural features, these students found the site far more preferable in every respect than did their peers who viewed what are basically study models. Furthermore, these differences were also reflected in some of the "adequacy" ratings. Thus, Site 100 was rated as more adequate in terms of "space for children's play" by participants in this sample when show high articulation models.

The Landscape Architecture students showed few differences as a function of model articulation. Site 100 was found more adequate with respect to visual privacy and Site 200 was rated as superior in overall evaluation of presentation given more articulated models. On the whole, with the oblique views these students were shown, both sites were found equally adequate and equally to their liking, regardless of building articulation.

It would seem from this pattern of results that articulation in models is a quality uniquely important to architects, for whom it is, after all, the sine qua non of their profession.

**Site rendition.** Turning to ratings as a function of contour vs. flat site rendition, there are again differences among the three samples. While there was agreement that the contour version was more effective in presenting the terrain, there were differences in terms of sites. For the architecture sample, terrain was considered better presented in the contour version at both sites. For the "client" sample this was true only at Site 100 and for the landscape architecture group at Site 200. Site 200 is, in fact, hillier and therefore has many more layers or steps in the contour rendition. It would appear that such a presentation format is distracting, and perhaps misleading, to the uninitiated; the "client" group, therefore, may have found contour layering more effective in the case of the site with relatively fewer contours. For the landscape architects, by contrast, the contours "translate"to terrain and were, therefore, considered more effective in the situation where they were needed to communicate more pronounced differences in elevation.

Such an interpretation gains further support from the responses to other items. The "client" sample rated Site 200 as more adequate in providing space for children's play, when viewed with the contour rendition. These photographs, with their many steps and buildings sitting atop steps, give the impression of play areas rather than continuous terrain differences if one is unpracticed at viewing layers as an abstraction of terrain. With the contour rendition, these students also found Site 200 as better at avoiding a crowded appearance.

The greater appreciation the Landscape Architects showed for the contour rendition is particularly evident for Site 100. Even though they did not rate either rendition better in communicating terrain differences, they did consider the site to be more satisfactory in several respects when it was presented with contour information provided. Thus, landscape architects in the contour condition (and viewing the site from an oblique perspective), rated the site more adequate with respect to walkways, ease of finding a particular apartment, and visual privacy.

Interestingly, the architecture students found the visual privacy more adequate under flat rendition conditions, thus differing from the other design-trained group. This is, however, consistent with a rather pervasive bias that was evident in the responses of the architecture students. Those who viewed the flat, as opposed to the contour, rendition, (holding articulation constant), expressed strong and consistent preference with respect to all of the items, save for a single exception. (This exception was the preference for the architecture of the buildings on the site, which was, after all, no different since these comparisons all involved the high articulation conditions.) It would seem then that the architecture students in this sample have a pronounced preference both for highly articulated building models and for flat site renditions, and that these preferences strongly color nearly all of their other judgments.

For participants lacking design training it appears that site rendition makes little difference if the site is relatively flat and adds distracting and misleading information if there is greater topographic variation. Only the landscape architecture group seems to have interpreted the contour layers as representing information about changes in elevation.

## CONCLUSIONS

These results are at the same time both encouraging and discouraging. From a participation point of view, it would seem that the lack of design training does not interfere with citizens' ability to make meaningful judgments of alternative site arrangements early in the design process. Expensive models are not needed to engage them in the process and to elicit feedback from them to incorporate in final decisions. The "client" group's preferences do not reflect a trained view of design considerations, but their ratings of adequacy show carefully made decisions. (Comparably thoughtul reactions to simple models have been reported by several other investigators [e.g., Hardie, 1983; Stea, 1984].)

The architecture students, by contrast, seem particularly sensitive to architectural considerations to the near exclusion of other issues. Their ratings seem almost binary: if they like the architecture and it is "carefully" represented, then they like everything else about the site as well; if the architecture is less interesting or less articulated, then the site is rated low with respect to everything else.

From the perspective of this study it cannot be determined whether these findings are specific to architecture students as opposed to practicing professionals, nor whether students in this program differ from others. There is, however, little grounds in these results for complacency. Clearly further research of this kind needs to be carried out to determine the generality of these findings. At the same time it may not be too early to begin thinking about the implications for the education of architects. After all, even though these results were quite unexpected, there is, in retrospect, substantial evidence for differences between designers and the public both in how they see and in what they appreciate (Hershberger, 1970; Simon, 1979). Most of these studies, however, merely point to the differences between groups. What these findings add, quite inadvertantly, is evidence that the distortion of reality is on the part of the designer, not the public.

The pervasiveness of the bias uncovered in this study suggests the importance, as a first step, of making design students aware of what might be described as a confusion of the aesthetics of means with the aesthetics of ends. The designer works for aesthetic results. This concern reflects a widely shared value. But the appropriate aesthetic of means may be a matter more of process than content. The means might be considered asethetic if they have incorporated user input effectively and if the users have found this a reasonably comfortable and satisfying process. The physical beauty of the models employed in the process might be considered of considerably less importance.

It may turn out to be the case that design students have to learn to see the beauty of this process, and of the simple models as vehicles for accomplishing this phase of design. As Lawrence (1982) has pointed out, the issue is not one of undermining the creativity or satisfaction in the design process, but of a replacement -- in a particular, circumscribed phase -- of one kind of satisfaction for another. It has been our experience that young designers are thoroughly capable of rising to this challenge.

## REFERENCES


Appleyard, D. (1977) Understanding professional media. In I. Altman and J. F. Wohlwill (Eds.) Human behavior and environment (Vol. 2). New York: Plenum.

Burden, E. (1970) Architectural delineation. New York: McGraw-Hill.

Carpman, J. R., Grant, M. A. & Simmons, D. A. (1986) Design that cares: Planning health facilities for patients and visitors. Chicago, IL: American Hospital Association.

Grant, M. A. (1979) Structured participatory input. Master's thesis in Landscape Architecture. University of Michigan.

Hardie, G. J. (1983) The use of simulations as a means of informing design from a "people" perspective. In D. Joiner et al. (Eds.) Conference on People and Physical Environment Research. Wellington, New Zealand: NZ Ministry of Works & Development.

Hershberger, R. G. (1970) A study of meaning and architecture. In H. Sanoff and S. Cohen (Eds.) EDRA 1.

Hohauser, S. (1970) Architectural and interior models: Design and construction. New York: Van Nostrand Reinhold.

Kaplan, R. (1973) Predictors of environmental preference: Designers and "clients." In W. F. E. Preiser (Ed.) Environmental design research. Stroudsburg, PA: Dowden, Hutchinson & Ross.

Kaplan, S. (1977) Participation in the design process: A cognitive approach. In S. Stokols (Ed.) Perspectives on environment and behavior. New York: Plenum.

Kaplan, S. and Kaplan, R. (1982) Cognition and environment: Functioning in an uncertain world. New York: Praeger.

Lawrence, R. J. (1982) Designers' dilemma: Participatory design methods. In P. Bart, A. Chen and G. Francescato (Eds.) Knowledge for design. Washington, D.C.: Edra.

Simon, J. G. (Ed.) (1979) Conflicting experiences of space. Louvain-LaNeuve: Catholic University of Louvain. (For example, articles by Imamoglu, Mikellides, Mueller.)

Stea, D. (1984) Participatory planning and design for the Third World. In W. G. Gilland and D. Woodcock (Eds.) Architectural values and world issues. Silver Spring, MD: International Dynamics.

For further information contact:
Rachel Kaplan
School of Natural Resources
University of Michigan
Ann Arbor, MI 48109
313/763-1061

# Environmental Design Research Association Conference


# Conférence de L'EDRA

## Public Environments • Les environnements publics

May 29 - June 2 • 29 mai - 2 juin
Ottawa • Canada • 1987

Co-chairs/ Les coprésidents
Editors/ Éditeurs
Joan Harvey • Don Henning

Proceedings • Communications