

EDUCATIONAL WORKPLACE WELL-BEING STUDY

L. F. Kilmartin* and C. D. A. Porteous**

*University of Strathclyde Centre for Facilities Management, Strathclyde
Graduate Business School, 199 Cathedral St., Glasgow G4 0QU

**Mackintosh Environmental Architecture Research Unit,
Glasgow School of Art, 167 Renfrew St., Glasgow G3 6RQ

ABSTRACT

The paper describes a pilot-study set up to identify links between internal environmental quality and perceived well-being in a 1970's higher educational building housing the Mackintosh School of Architecture. The supposition is that such links may in turn inhibit/promote greater productivity. The study embraces a variety of working situations for staff and students and explores levels of satisfaction and dissatisfaction by means of questionnaire. Although limited in its size with 180 respondents as well as in its scope, since it lacks objective measurements other than those concerning definition of space, the study provides evidence of linkage between such known physical parameters and perception. For example, 'satisfaction' to 'dissatisfaction' slopes/curves for environmental criteria are evident relative to orientation and distance from windows. Priorities are also ranked, with cramped space the greatest concern.

1 BACKGROUND AND NEED

The context of this study is an economic climate which has steadily increased numbers of students in most sectors of higher education, while decreasing numbers of staff as well as related recurring costs. Adjustment to buildings is often nominal. Increasing pressure on space inevitably threatens the quality of a series of environmental characteristics. For example, a system for ventilation may no longer be able to deal adequately with CO₂, humidity, temperature and odour; noise may be a greater nuisance and occupants are more likely to have to work in unsalubrious locations in terms of daylight, privacy and so forth. Partly due to the less favourable student:staff ratios, students are expected to become more independently active in pursuit of knowledge and development of skills at a time of increasing economic pressures. Hence it is hoped that this initial study may be extended in the case of students to include psychological aspects such as anxiety and stress together with physical aspects such as diet.

Used positively, 'well-being' implies a state of being which is predominantly healthy, physically comfortable and unstressed, and with a 'feel-good' psychological dimension denoting an alert, positive attitude to tasks in their particular setting. On the other hand, lack of well-being implies deficiency in such attributes, and hence a loss of potential in fulfilling tasks. Jones et al (1995) hypothesised that "health is the outcome of a complex interaction between the physiological, personal and organisational resources available to the individual, and the load placed upon them by their physical environment, work and home life." Research in this area has typically been directed to workers in the post-educational period. Evidence of what has become termed 'Sick Building Syndrome' (SBS), some of it based on studies which specifically include the influence of personal characteristics, job-related factors and psychosocial factors (Skov, Valbjorn and Petersen 1989), also suggests that illness, general lack of well-being and dissatisfaction with the working environment is related to a complex set of circumstances. Some, such as presence of pollutants in the air, are physical; while others, such as degree of control over personal environment are more psychologically rooted. Cases are cited (Tong and Wilson 1990) where naturally ventilated buildings result in rather poor quality of air; but in terms of SBS such a building may score favourably compared with an air-conditioned building where a better theoretical quality of air is offset by a perceived inability to adapt or change the environment. A small study of primary schools in North Carolina (Nicklas 1996) indicated a connection between pupils' performance and access to daylight; and Cawthorne (1994) has linked lack of daylight to lowered well-being in a predictive model. Studies also indicate a gender-bias (Stenberg and Wall 1995), the SBS rate higher for women. There are several possible explanations such as prevalent type of work and hierarchies related to more environmentally favoured parts of a building, but there are still many unknowns. Generally there is a dearth of reliable data on this topic across the educational spectrum.

2 EDUCATIONAL SETTING AND METHODOLOGY

The Mackintosh School of Architecture (MSA) within the Glasgow School of Art is located in a fairly typical structure of the 1970s oriented on a roughly north-south axis. The main studios have single-glazed windows to north, east and west. Most offices for staff and postgraduate students face south, but some are on the north, east and west edges. Studios are primarily heated and ventilated by a warm-air recirculation system, with flow and return ducting exposed below unpainted concrete floor slabs, and windows may be opened to facilitate intake of fresh air over and above that provided by the mechanical system. Offices are heated with normal radiators, without readily adjustable thermostatic valves.

Accommodation is located on the first and second floors, the former having a narrower depth around a core with lecture and computer rooms, and the latter

around a T-shaped circulation zone. Thus it is varied environmentally, houses particular learning functions, such as drawing and model-making, and has a specifically creative bias in a relatively liberal educational setting. Compared with other academic disciplines, students of architecture, with a roughly 60:40 male:female split, are likely to spend significantly more of their working time on campus - 12 hours daily is commonplace for both students and staff.

Questionnaires had two main sections, the first dealing with routine information including demographics and an invitation to prioritise changing or improving three environmental aspects from a list of fourteen, and the second addressing six characteristics in terms of satisfaction. These were associated with light (subdivided into artificial light, sunlight and daylight) and air together with thermal (subdivided into temperature, humidity and air movement), tactile/visual (including layout of space, type of furniture, floor and wall finishes), aural and social (including issues such as privacy and amount of space). A score of 1 signified the most positive, 3 neutral and 5 the most negative, and each aspect was split into amount, quality and control. For example there might be a lot of artificial light, with a negative qualitative character, and impossible to control. Respondents were also asked to give a productivity rating relative to each of the six groups on the same scale of 1-5., and to mark their most common working location on plans to be correlated with a detailed layout of furniture.

2 RESULTS

The survey showed that 47% of respondents occupied the building for more than 40 hours weekly, more than 90% of this group in the 40-60 hrs/wk band. In terms of the amount and quality of the six environmental aspects, the greatest level of dissatisfaction lay with tactile/visual, aural and social, although looking at quality on its own, similar levels are indicated for light and there is also a high level of dissatisfaction in terms of fresh air, Table 1.

Table 1 Levels of dissatisfaction (% worse than neutral) for six aspects

light	thermal		tactile/	aural	social	air		
art'l	nat'l	sun	temp.	hum'y	visual			
33%	39%	36%	35%	30%	61%	51%	49%	42%
53%	41%	40%	39%	25%	57%	49%	41%	43%
71%	81%	78%	78%	54%	53%	80%	59%	64%

note: 1st row = quantity; 2nd row = quality; 3rd row = control

It may be noted that predictably the difference between quantity and quality for most of the aspects seems to have been a difficult concept for respondents. Also the marked level of dissatisfaction with respect to control in all aspects is not generally reflected in the self-assessed impact on productivity, Table 2, aural and tactile/visual being the notable exceptions.

Table 2 Assessment of impact on productivity for six aspects

	light	thermal	tactile/ visual	aural	social	air
negative	26%	32%	49%	52%	41%	29%
neutral	40%	34%	29%	26%	22%	41%
positive	34%	34%	22%	22%	37%	59%

This result correlates well with the 'wish list' of improvements, Fig. 1, where more workspace is the dominant issue followed by better ventilation, change to artificial lighting, more daylight, more privacy and improved acoustics, all with fairly similar scores. Within the tactile/visual and social aspects, space and privacy are the issues rather than change of view or floor/wall finish, which have modest scores, and access, location, furniture and circulation, which appear to be of little concern.

When ratings of satisfaction/dissatisfaction are plotted against orientation, Figs. 2-4, there seems to be pronounced feeling in favour of south-facing windows compared with north, east and west. However, this may be misleading in that the southern edge comprises individual rooms, with the greater level of environmental control that this offers. The results gained by plotting ratings against distance from windows, Figs 5-9, indicate a trend for the level of dissatisfaction to increase the further the user is from the perimeter. However, if a number of clusters of students are isolated, Table 3, complexities are evident. The impact of sound relative to productivity is consistently worse close to the corridor, but the cluster adjacent to the north facade also has high negative scores compared with the two clusters within 4m of the east facade.

Table 3 % impact of 4 aspects on productivity for 6 clusters of students

cluster (sample size in parenthesis)	daylight		tactile/ visual		aural		social		air						
	-	n	+	-	n	+	-	n	+	-	n	+			
Note: 'n' signifies neutral	-	n	+	-	n	+	-	n	+	-	n	+			
No 1 (11) east window; 2.7 m ² /p	9	45	46	20	30	50	18	27	55	9	55	36	10	40	50
No 2 (7) east window; 4.3 m ² /p	14	29	57	14	43	43	29	43	28	29	14	57	14	43	43
No 3 (7) north window; 3.4 m ² /p	40	40	20	57	29	14	50	33	17	71	29	00	--	--	--
No 4 (7) west corridor; 3.3 m ² /p	17	33	50	43	14	43	71	0	29	43	29	28	20	80	0
No 5 (7) east corridor; 3.4 m ² /p	60	0	40	80	20	0	100	0	0	80	0	20	20	40	40
No 6 (7) east corridor; 4.4 m ² /p	0	43	57	14	57	29	83	17	0	40	40	20	14	71	15

3 CONCLUSIONS

°The study confirms that there is cause for concern in terms of both well-being and productivity relative to certain environmental characteristics. In particular lack of space and disturbance due to noise appear to be the dominant issues.

°The study also confirms that apparent dissatisfaction with respect to various environmental parameters, and in particular to environmental controls, does not necessarily correspond with the perceived impact on productivity; and that there is a normally a counterbalancing positive impact about a neutral position.

°Orientation seems to be significant, although some results may be biased by respondents who are in individual offices. Distance from the perimeter of the building also appears to be significant. The apparent negative effects of being located close to the north facade relative to a series of environmental aspects is not easy to explain other than in terms of lack of access to sunlight. (It should be noted that responses to sunlight were very similar to daylight.)

°There is a need for a more detailed study in order to correlate subjective responses with more comprehensive objective measures (physical parameters such as temperature, relative humidity, CO₂ level and air movement, as well as records of attendance), and also to include relevant psychosocial aspects.

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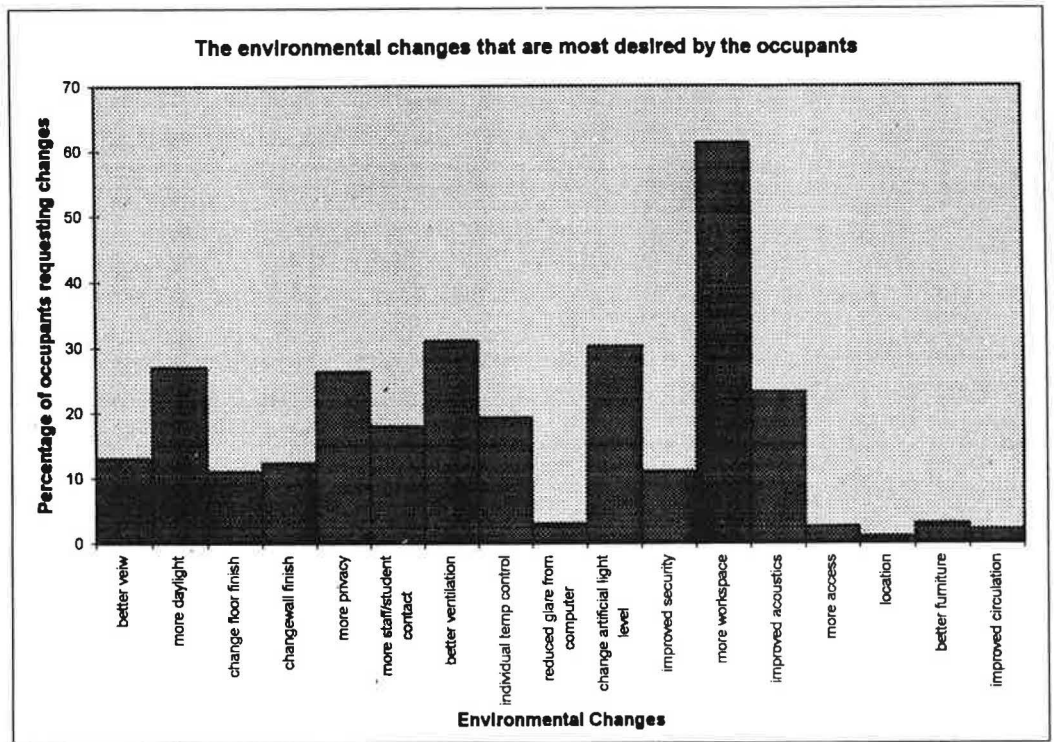


Figure 1.

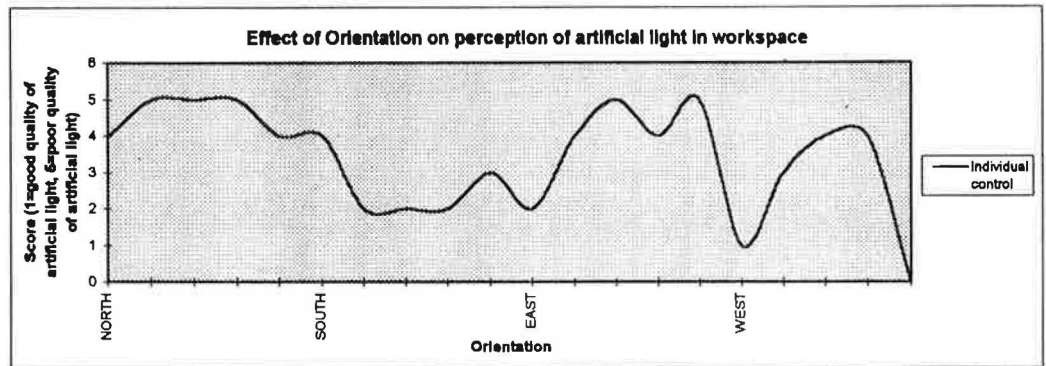


Figure 2.

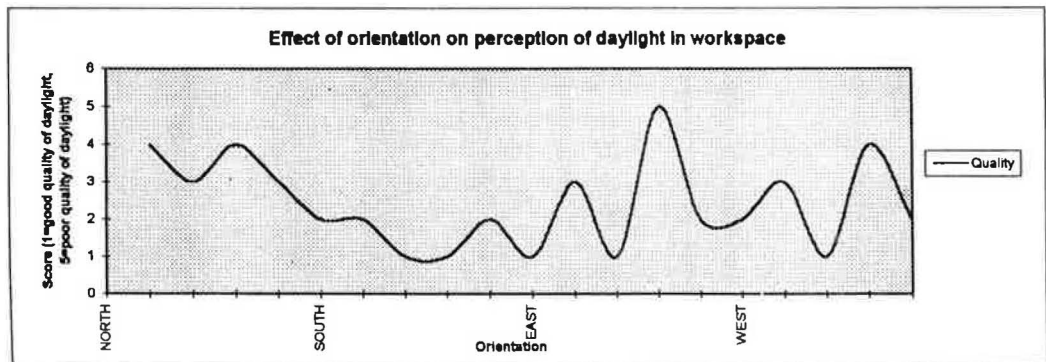


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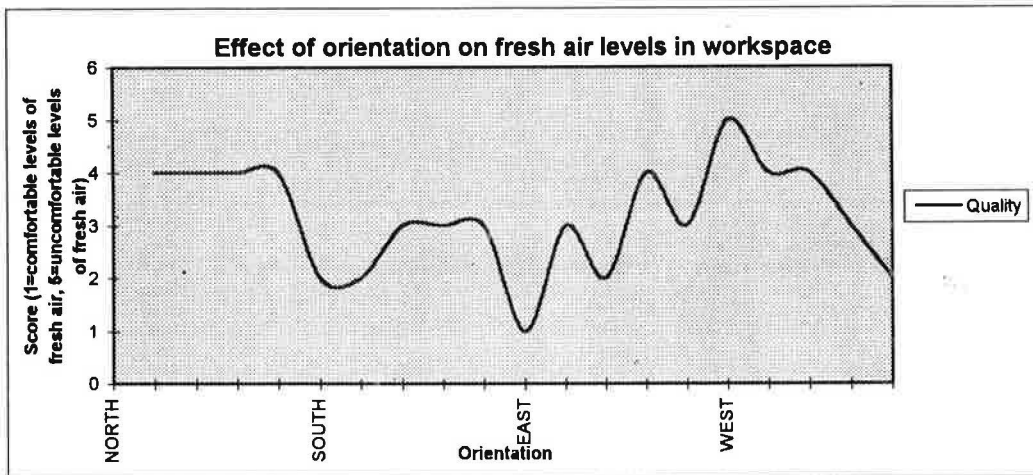


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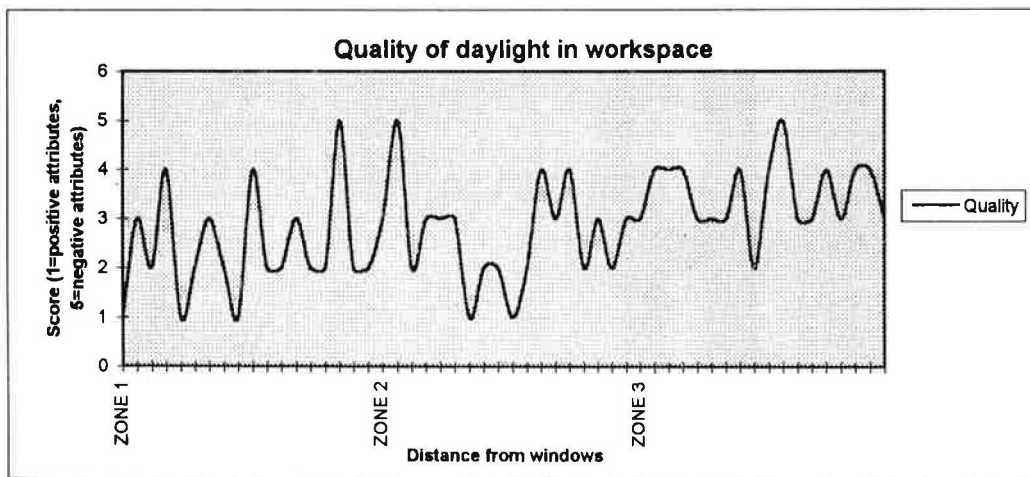


Figure 5.

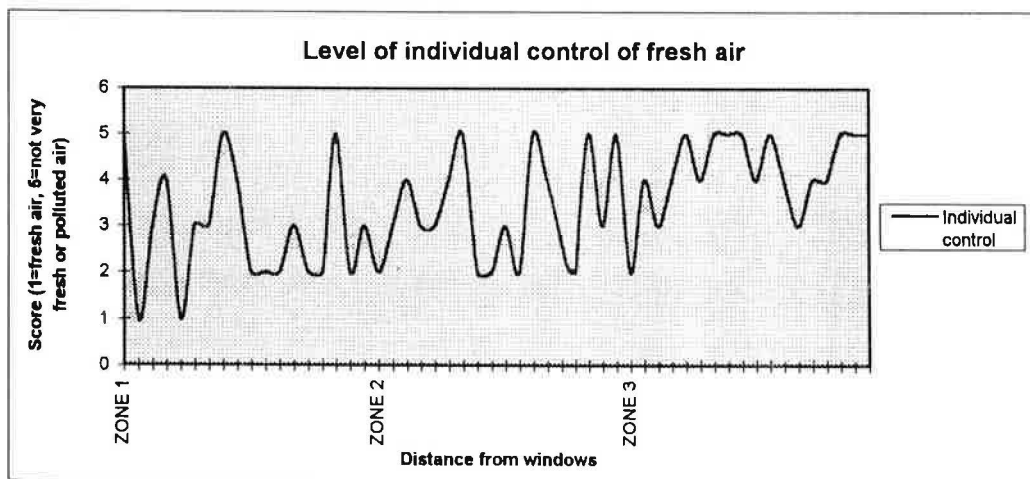


Figure 6.

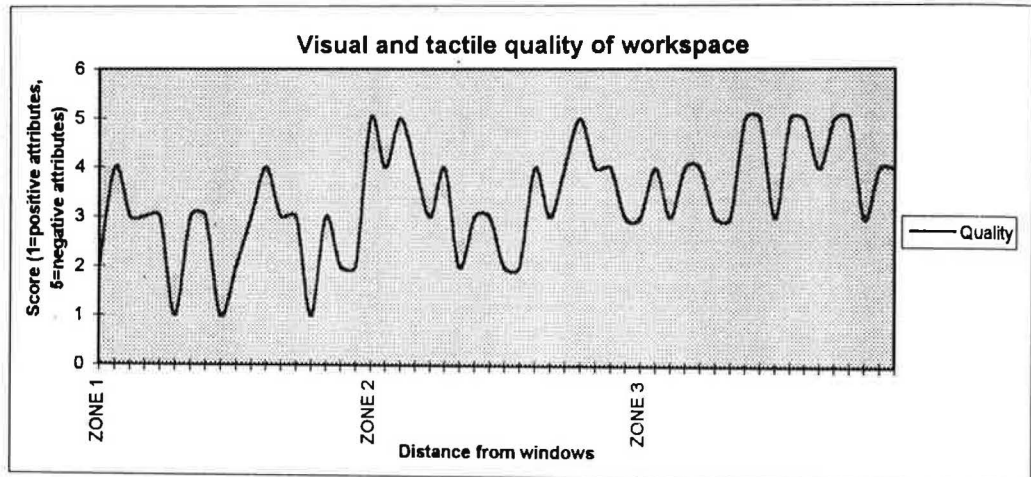


Figure 7.

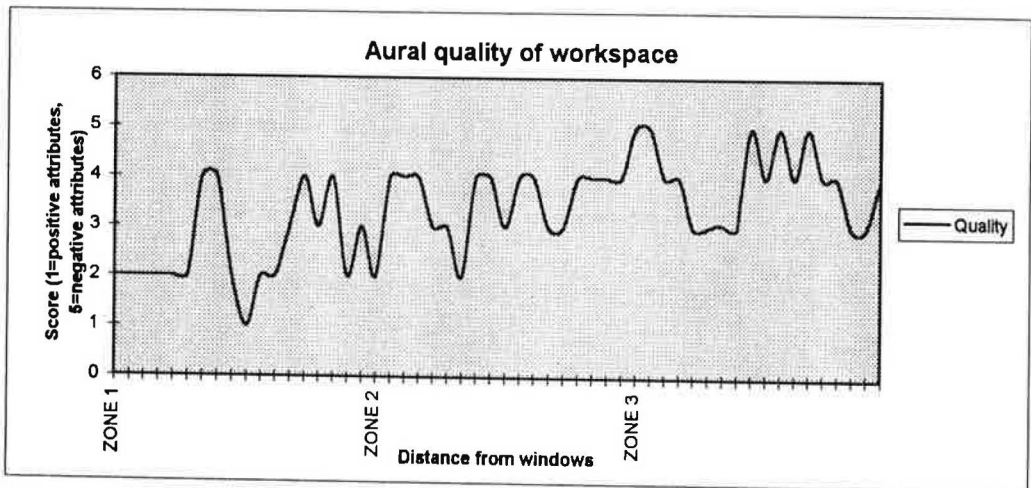


Figure 8.

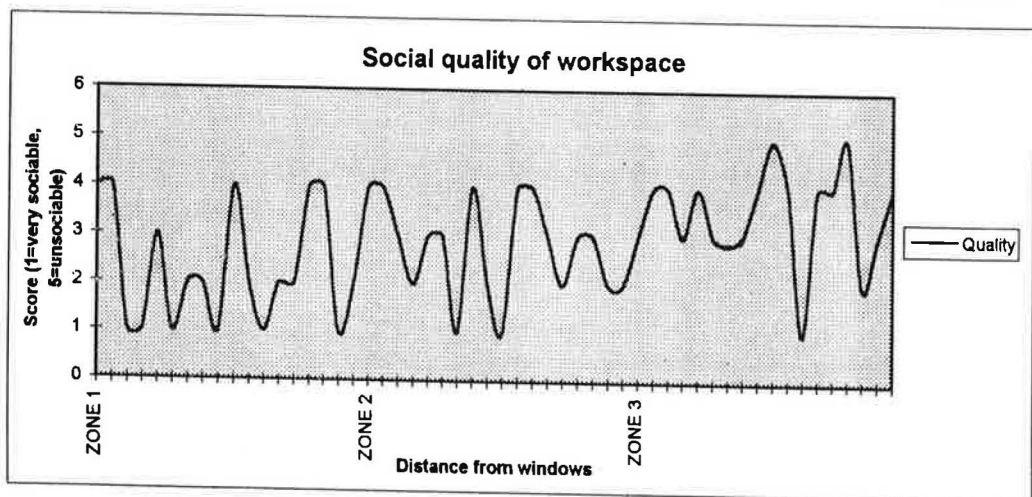


Figure 9.