

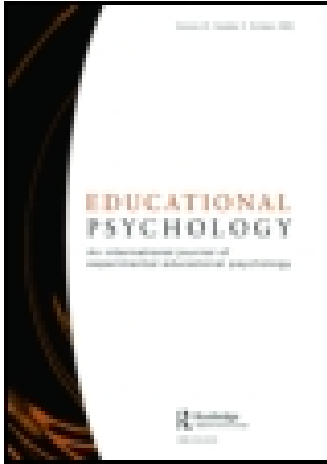
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Publisher: Routledge

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Educational Psychology: An International Journal of Experimental Educational Psychology

Publication details, including instructions for authors and
subscription information:

<http://www.tandfonline.com/loi/cedp20>

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Published online: 29 Sep 2006.

To cite this article: Kevin Wheldall & Yin Yuk Lam (1987) Rows versus Tables. II. The Effects of Two Classroom Seating Arrangements on Classroom Disruption Rate, On-task Behaviour and Teacher Behaviour in Three Special School Classes, *Educational Psychology: An International Journal of Experimental Educational Psychology*, 7:4, 303-312, DOI: [10.1080/0144341870070405](https://doi.org/10.1080/0144341870070405)

To link to this article: <http://dx.doi.org/10.1080/0144341870070405>

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RESEARCH NOTE

Rows versus Tables. II. The Effects of Two Classroom Seating Arrangements on Classroom Disruption Rate, On-task Behaviour and Teacher Behaviour in Three Special School Classes

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SUMMARY *Seating arrangements in which children sat in rows and around tables were compared experimentally in three classes in a special school for behaviourally troublesome children with moderate learning difficulties. Children were observed daily in four two week phases: seated around tables, then in rows, again around tables, and finally again in rows. Percentage on-task behaviour was recorded along with rate of pupil disruption and rates of teacher approval and disapproval. In all three classes on-task behaviour doubled from around 35% to 70% as the conditions changed from tables to rows. Moreover, rate of disruption was three times higher in tables conditions. Teacher behaviour was also affected; positive comments increasing during rows whilst negative comments decreased. It is argued that these studies support the results of previous studies regarding the importance of ecological variables, such as seating, on classroom behaviour.*

Introduction

In recent years a welcome re-direction of experimental effort is becoming apparent within applied behaviour analysis in the field of education. Antecedent control of children's classroom behaviour has become an area of increasing research interest (Glynn, 1982, 1985). Behavioural interventions in classrooms based on traditional consequence management strategies are giving way, to a limited degree, to a concern with ecological variables and manipulations of setting events.

Classroom seating arrangements are now known to be important ecological variables

influencing various forms of classroom behaviour. Moore & Glynn (1984), for example, have clearly demonstrated experimentally that where children sit, i.e. their location in the classroom, influences the number of questions they are asked by their teachers. Similarly, Krantz & Risley (1977) showed experimentally that crowded seating arrangements for kindergarten children led to reduced attention to the teacher during story sessions.

Axelrod, Hall & Tams (1979) compared two common classroom seating arrangements, traditional seating in rows versus the more contemporary grouped seating around tables. A class of below average seven to eight year-olds were shown to increase their level of on-task behaviour 20% during rows style seating, in a convincing experiment employing an ABA reversal design. In a similar experiment with a class of average 12-13 year-olds they found that 'talk-outs' (disruptions) decreased markedly during the experimental phase when the class was seated in rows.

Wheldall, Morris, Vaughan & Ng (1981) subsequently replicated the findings of Axelrod *et al.* with two top junior classes in British primary schools. (They also provide a review of previous research on classroom seating which stretches back over 50 years.) In both classes on-task behaviour was shown to increase 15% on average when seating was changed from tables to rows during the experimental phase and fell back again when tables seating was resumed. Their analyses showed that the effect was particularly pronounced for children with low initial on-task behaviour. Bennett & Blundell (1983) subsequently provided evidence to suggest that such increases in on-task behaviour resulting from rows style seating were accompanied by improvements in both the quantity and quality of work produced.

Given that in the Wheldall *et al.* study improvements in classroom behaviour were greatest for children with low initial on-task behaviour, it was decided to attempt to replicate their findings with three more classes in a special school for behaviourally troublesome children with moderate learning difficulties. In addition to observing and recording pupil on-task behaviour it was also decided to monitor incidence of disruptive behaviours and relevant teacher behaviours, in terms of use of approval and reprimand.

Method

Subjects and Setting

This study was carried out in a large special school in the West Midlands catering for behaviourally troublesome children with moderate learning difficulties. The multi-ethnic school population included a high proportion of children of families originating from India, Pakistan and the West Indies. The school was divided into three sections—Lower School, Middle School and Upper School, the children being grouped according to age. The subjects of this study included a mathematics teacher, an English teacher and 34 pupils from the Upper School. The pupils (24 boys and 10 girls) were aged 12 to 15 years. Classes 2U (with 11 14 to 15 year old pupils), 3U (with 11 13 to 14 year old pupils) and 4U (with 12 12 to 13 year old pupils) participated in the study. Many of these children, apart from being slow learners, were described by their teachers as 'emotionally disturbed'. They exhibited frequent 'out-of-seat' and 'talking out of turn' behaviours and showed little interest in reading or mathematics.

The maths teacher was male, in his mid twenties, with two years of teaching experience. The English teacher was female, in her fifties, with over 20 years of teaching experience. Both teachers readily agreed to take part in the study. When the

teachers were initially approached, they were informed that the study concerned “the on-task behaviour of the pupils in different classroom seating arrangements”. Precise details of the observation schedule were not discussed with them.

The two classrooms of interest for this study were the mathematics room (designated the experimental classroom) and the English room (designated the control classroom). During baseline and reversal phases (see design) desks were arranged in three groups of four in the experimental classroom, with two being placed by the side of the wall and one against a centrally-placed cupboard. The teacher sat in the left-hand corner of the room. This ‘tables’ arrangement was the usual layout for the classroom. During the second and fourth intervention phases, desks were arranged in three rows of four and one row of three (‘rows’ arrangement). The teacher occupied the same position. In the control (English) classroom, desks were arranged in seven small groups with pupils sitting in pairs facing each other. The teacher sat at the centre-front of the classroom.

Classroom Observation Procedures

The present study attempted to compare experimentally the classroom behaviour of both the pupils and the teachers in two different seating arrangements—in tables formation and in traditional rows formation. An earlier, modified version of the Observing Pupils and Teachers In Classrooms (OPTIC) schedule was employed, which is described fully by its authors in an earlier article in this journal (Merrett & Wheldall, 1986) and, hence, need not be described fully here.

In this version of the schedule (CTP2) teacher behaviour, pupil disruptions and pupil on-task behaviour were observed and recorded. The teachers’ positive and negative responses, both verbal and non-verbal, to pupils’ academic and social behaviour were recorded, defined as follows: positive events included verbal praise and encouragement, approving gestures like nodding and smiling, physical contacts like patting on the shoulder and the granting of privileges; negative events included verbal criticism, general disapproval, reprimands, gestural responses such as frowning and glaring, withdrawal of privileges and aversive physical punishment such as smacking. Pupils’ disruptive behaviour was defined as interruption on the part of the pupils which drew the attention of others in the class away from the task(s) they were engaged in. This included talk-outs, making unnecessary noise, turning around, getting out of seat without the teacher’s permission, banging the desk and aggressive acts towards peers. Pupil on-task behaviour was defined as attending to the teacher or the assigned task, showing an orientation towards the appropriate materials (e.g. reading), manipulating learning aids, being in eye contact with the teacher or the task, following instructions or teacher requests and being out-of-seat only with the teacher’s permission.

Design

An ABAB reversal design was employed in this study with all three classes. Observations were conducted in the experimental classroom during mathematics lessons throughout the four experimental phases and were also carried out in the control classroom during English lessons for the last two phases and for an additional post-experimental week with the same group of children. The control sessions were included in order to establish a form of multiple-baseline comparison. Alternation of

seating from tables formation to rows formation took place in the experimental classroom during Phase 2 and Phase 4 but seating arrangements remained constant in the control classroom.

Observations were conducted for three days a week on Mondays, Tuesdays and Wednesdays as the mathematics lessons were concentrated in these three days. It was, therefore, possible to collect data for every mathematics lesson for all three classes during the investigation period.

In the control classroom, data were collected during the English lessons on Thursday and Friday mornings for 2U and 4U, and on Monday and Tuesday afternoons for 3U. This was to fit in with the timetable of both teachers. In order to compensate for the fact that relatively less data were collected for the English lessons, observations were extended to a post experimental week in the control classroom.

Behavioural Recording and Reliability

A complete observation session took 45 minutes. During this period all target behaviours were monitored. The method of recording each target behaviour was as follows (see Merrett & Wheldall, 1986, for full details):

Teacher behaviour. The teacher was observed three times for three minutes each time. During each period the observer paid attention to the teacher and recorded each occurrence of the relevant behaviours (positive and negative behaviours directed towards the academic and social behaviours of the pupils).

Pupil disruptive behaviour. The whole class of pupils were observed three times for three minutes each to record every instance of disruptive behaviour which interrupted the continuity of the working behaviour of the class.

Pupil group on-task behaviour. The whole class was divided into convenient and approximately equal groups (four in the case of the experimental classroom and three in the case of the control classroom) and observed three times for one minute each. The observer paid attention to each group in turn. The observer looked at each child in each group in turn for five seconds and decided for that five seconds only, whether he/she was on or off-task. To be on-task, the pupil had to be paying attention to the assigned task for the whole of the five seconds. By this means an estimate of percentage on-task behaviour for the class each session was obtained.

Pupil individual on-task behaviour. In addition, each child was observed individually twice, each time for one minute. The on-task behaviour of each child was monitored at each of the twelve five-second marks during the minute. If the child was on-task for the whole of the five seconds, the observer rated him or her as on-task. This yielded individual on-task percentages.

Each observation session began five minutes after the commencement of the lesson and terminated ten minutes before the end of the lesson. Reliability checks were conducted by trained student observers who had received instruction in classroom observation and recording as part of their course. Measures of inter-observer agreement were collected for one observation session every week throughout the experi-

mental phases for class 2U. The two observers simultaneously rated the classroom behaviours. Percentage agreement figures were then calculated using the usual formula: agreements divided by agreements plus disagreements.

Experimental Procedure

The whole observation period lasted for four months with a total of 39 observation days being divided into four experimental phases and a post-experimental week in the control classroom. The various phases were introduced to the three classes at the same time. The experimental phases were as follows:

Tables 1. This was the baseline period and lasted for four weeks (with 11 observation days). Initially, students sat in tables formation as was the case before the study commenced. The seats were chosen by the students and they occupied the same seats for every mathematics lesson.

Rows 1: The Rows 1 phase lasted for three weeks (with eight observation days). The pupils' desks were changed from the tables formation to the rows configuration. The children in the same group were arranged to sit in the same row. Initially, they made a few comments when they noticed the new seating arrangement. The teacher helped them find their new locations and then carried on teaching in the usual manner.

Tables 2. This phase lasted for three weeks (with nine observation days). The same seating arrangement as in Tables 1 phase was reinstated. Seats were moved before the children arrived. In addition, during this phase all three classes of children and the English teacher were also observed in the control classroom during the English lesson. Target behaviours were recorded in the same manner as in the experimental classroom for two days per week in each class (with six observation days). Seats were not assigned and the children took their usual seats as before.

Rows 2. During the final phase of the experiment the rows condition was reinstated exactly as it had been in the Rows 1 phase in the experimental classroom. This phase lasted for three weeks (with nine observation days). Observation was also conducted in the control classroom in the same period. No manipulation of seating arrangement took place. There was a total of six recordings in each class during this equivalent of the 'Rows 2' phase.

Post-experimental Phase. Data were collected for two further days in the control classroom after the completion of Rows 2 phase in the experimental classroom. Seating arrangements in the control classroom remained unchanged.

Results

As previously mentioned, checks on inter-observer agreement were made once per week in class 2U only (12 occasions). Percentage measures of inter-observer agree-

ment were obtained on all target behaviours and the overall means and ranges are shown in Table 1.

TABLE I. Mean percentage inter-observer agreement for the various classroom behaviours and range of values obtained over the twelve sessions in which a second observer was present

	Mean	Range
On-task behaviour (group)	91	85-97
On-task behaviour (individual)	93	79-100
Disruption	91	75-100
Teacher behaviours	86	72-100

As Table I shows inter-observer agreement was high, averaging over 85%, for all behaviours across the twelve sessions when a second observer was present. Values were lower than 79% on only one occasion for disruptive behaviour (75%) and on only two occasions for teacher behaviours (72% and 76%); for both measures of on-task behaviour no value was lower than 79%.

In general, the results indicated that substantial changes in both teacher behaviours and pupil behaviours were evident as a direct result of the changes in the seating arrangement in the experimental classroom for all three classes, whereas the behaviours of both the teacher and students remained relatively stable in the control classroom. During the experimental conditions (rows 1 and 2) when the seats were arranged in rows, students' group and individual on-task behaviours increased substantially and disruptive behaviour decreased markedly. Concomitantly, teacher disapproval decreased while approval increased. When the tables formation was re-instated during Phase 3, the rate of the various target behaviours returned to baseline levels. Table II shows the mean scores of the subjects for the various target behaviours during the four experimental phases. In the control classroom neither the teacher nor the students exhibited noticeable, consistent changes in the various target behaviours. The mean scores of the subjects for the various target behaviours during the control sessions are presented in Table III.

As may be seen from Fig. 1, in all three classes on-task behaviour doubled (from around 35% to 70%) during rows and fell during the tables formations. A large majority of the children (88%) exhibited greater individual on-task behaviour when sitting in rows. There was no evidence of any decrease in on-task behaviour during the rows condition in any of the 34 experimental subjects. The rate of disruptions, concomitantly, trebled during the tables conditions and dropped back when the students sat in rows, as may be seen from Fig. 2.

These differences were also accompanied by changes in teacher behaviour. Positive responses consistently increased during rows arrangements whilst negative responses decreased. Interestingly, more dramatic changes were recorded in the teacher's response towards the students' conduct during the rows conditions. The rate of approval was four times higher during rows whilst disapproval dropped to one-third of that during the tables conditions. Teachers' positive comments on academic behaviour doubled as seating arrangement alternated from tables to rows. In the control classroom, however, no consistent changes were evident between phases for on-task behaviour, disruption or teacher behaviours, as Table 3 shows.

TABLE II. Mean scores on various measures during the four experimental phases

	Teacher behaviours				Pupil behaviours		
	Positive events		Negative events		% of on-task behaviour (group)	% of on-task behaviour (individual)	Disruptions
	Academic	Conduct	Academic	Conduct			
2U							
Tables 1	3.18	0.45	7	13.08	29.03	27.24	48.75
Rows 1	8.88	4.63	2.63	5.38	72.97	71.97	10.38
Tables 2	4.22	0	8	12	33.36	32.31	28.33
Rows 2	7	2.1	3.44	3	67.90	67.81	8.56
3U							
Tables 1	2.36	0	5.73	10.18	34.31	34.40	25.45
Rows 1	9.13	7.25	3.13	5.75	74.21	72.22	8.75
Tables 2	3.56	0	5.78	11.56	39.05	37.02	23.89
Rows 2	4.44	2.22	3.22	3.44	71.34	70.76	7.11
4U							
Tables 1	3.82	0	6.27	8.64	38.61	37.49	17.73
Rows 1	11	5.88	2.13	1.25	73.96	72.98	6.13
Tables 2	2.11	0	6.67	10.89	36.75	36.37	18.83
Rows 2	6.44	1.56	3.11	4	70.20	69.03	7.67

TABLE III. Mean scores on various measures during the 'control' sessions

	Teacher behaviours				Pupil behaviours		
	Positive events		Negative events		% of on-task behaviour (group)	% of on-task behaviour (individual)	Disruptions
	Academic	Conduct	Academic	Conduct			
2U							
Tables 2	2.33	0	6.83	15.83	38.89	36.99	29.67
Rows 2	1.5	0	11.33	23.17	33.90	32.84	33
Post-experimental	6	0	7.5	25.5	37.88	37.48	29
3U							
Tables 2	1.33	0	6.33	15.83	34.34	33.63	24.5
Rows 2	1.83	1	8.33	13.17	33.99	32.68	18.17
Post-experimental	1	0.5	9.5	21.5	39.39	38.04	29.5
4U							
Tables 2	2.33	0.5	10.33	13.5	37.96	35.61	23
Rows 2	2	0.5	10	14.17	40.27	37.67	22
Post-experimental	0.5	0	7.5	12	36.11	34.19	26.5

Discussion

The purpose of the present study was to investigate the functional importance of seating arrangements on student on-task behaviour and disruptive behaviour and any concomitant effects on teacher approval and disapproval. The results confirmed that

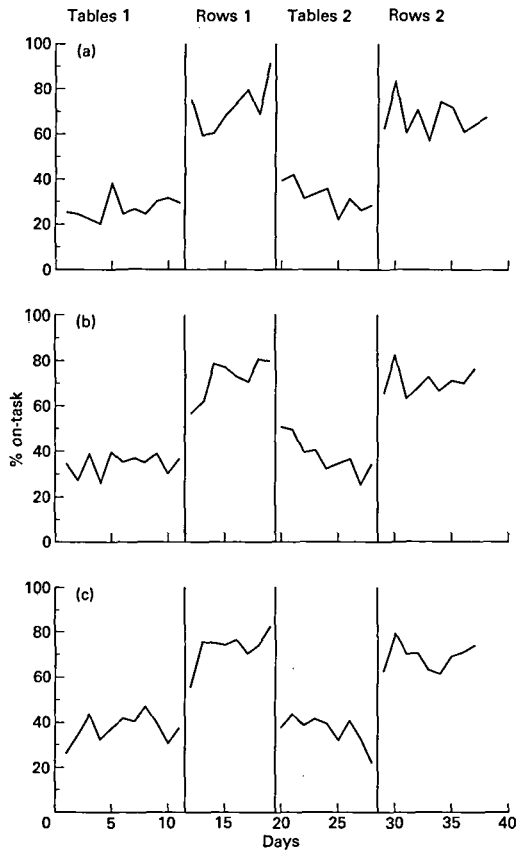


FIG 1. Average on-task behaviour of: (a) 11 children (Class 2U); (b) 11 children (Class 3U); (c) 12 children (Class 4U).

seating arrangements have significant effects on children's classroom behaviour and also on the behaviour of their teachers.

These findings support Axelrod *et al.*'s (1979) suggestion that the proximity and face-to-face relationship of pupils in tables formations facilitates disruptive and off-task behaviours as they offer more opportunities for interaction undetected by the teacher. The present study confirms that the rows formation is superior to tables arrangements for individual academic work. Students' conduct improved, accompanied by increased on-task behaviour, and the teacher found it easier to praise and to refrain from disapproval under such circumstances.

This study highlights the importance of ecological factors in classroom management. During the tables formation, the teacher's attention was predominantly negative. However, this was not accompanied by a decreased number of disruptions and percentage student on-task behaviour remained low. This is in line with the findings of Thomas, Becker & Armstrong (1968) who found that teachers can create problem behaviours by aversive responding.

The superiority of the rows arrangement in this study as an effective means of increasing on-task behaviour with fewer disruptions or distractions is clear. However, it must be emphasised that it is not necessarily the best arrangement for all kinds of learning activities. For example, rows formation will be an inappropriate and inferior

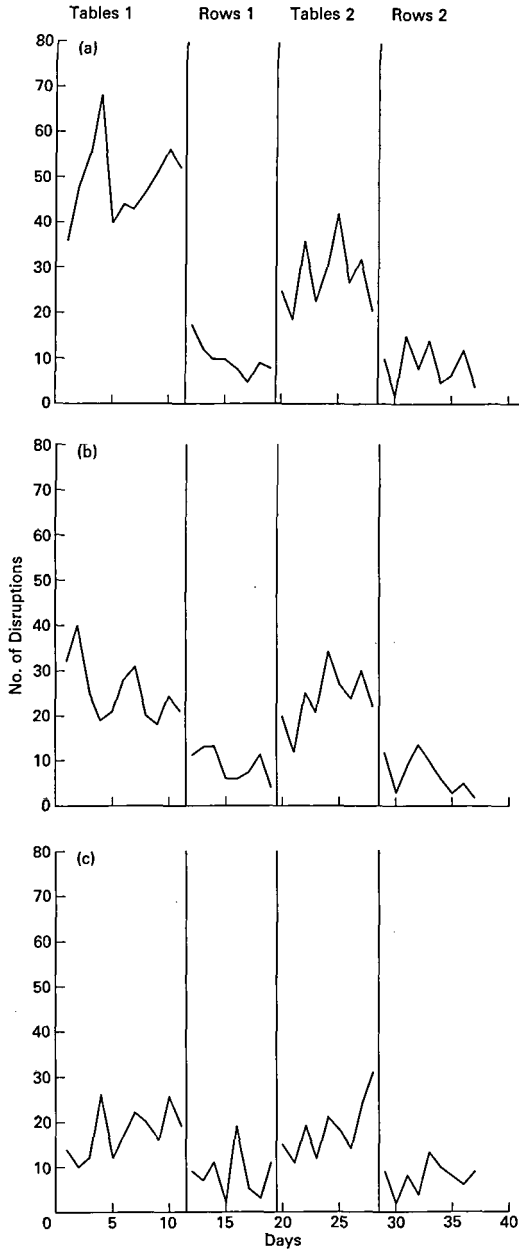


FIG. 2. Number of disruptions in class: (a) Class 2U; (b) Class 3U; (c) Class 4U.

arrangement for topic work and group discussions which, on the contrary, can be facilitated by a tables arrangement which allows for proximity and direct face-to-face interaction among group members. Classroom seating arrangements can be systematically manipulated so as to provide an optimal environment for a particular task to be achieved and for desirable behaviours to be encouraged. Static classroom spatial arrangements should give way to purposeful and experimental manipulations to suit the task in hand.

It has been demonstrated that the effects of the manipulation of spatial arrangement are comparable to those achieved with more traditional contingency management procedures. Behavioural ecology should therefore become as important a focus for applied behaviour analysis as contingency management. The identification of setting events which serve to increase appropriate and/or to decrease inappropriate behaviours is of paramount importance. The experiment reported here indicates that attention to setting events such as seating arrangements may result in the development of classroom environments that generate and maintain desired child and teacher behaviours.

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