

THE *MIXER-UPPER-ER*: A SYSTEMATIC WAY TO GROUP STUDENTS

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Abstract: How do you solve the age-old problem of grouping your students so that they work with different people? The Mixer-upper-er is a new way to achieve this! It enables teachers to systematically mix students so that, over a series of groupings, every student in a class works with every other student in the class once. In this session participants will experience and learn how to use the Mixer-upper-er. This session will also report on the trial of this tool and share the beauty of the mathematics behind it. The trial was conducted in primary, secondary and tertiary classrooms. (Although this tool is now available commercially as a poster, this is a non-commercial presentation).

Introduction

This paper reports on trials of a co-operative learning tool that I have developed. The tool is a technique for systematically mixing groups of students in classroom learning activities. It enables every student to work with all other students in a class over a set of six activities. It is intended to encourage social integration/mixing and educational co-operation amongst students. The first part of this paper explains the use of the *Mixer-upper-er* in classrooms. Following this the second section outlines the mathematics behind the development of this tool. The third and final section reports on the trials of this tool.

Early in 2007, the tool was trialled by teachers working with Year 7 and Year 8 neighbourhood groups in a regional Victorian secondary school. This pilot study evaluated the effectiveness, applications and uptake of the tool by seeking the views of teaching staff involved in its school trial. The findings from this study formed the basis of a further, more extensive study of the *Mixer-upper-er* that was conducted in 2008. This more extensive study was conducted in primary, junior secondary, senior secondary and tertiary classrooms. This paper reports on the pilot study and initial findings from the 2008 study.

Assigning Students to Groups

The cooperative learning literature has three general categories for the assignment of students into groups, these are student selection, random selection and teacher selection (with heterogeneous grouping) (Artzt & Newman, 2003; Brown and Thomson, 2000; Slavin, 1994).

It is generally suggested that student selection should not be the norm, although groupings based on interests or shared needs (such as specific skill development) may be valuable at times (Brown and Thomson, 2000; Murdoch & Wilson, 2004). Research has found that self-selection into groups is less desirable because it reinforces and stabilizes cliques, increases of task behaviour, and isolates socially excluded students. Consequently, random selection and teacher selection are generally preferred (Brown and Thomson, 2000; Slavin, 1994).

Random selection has many advantages, it is perceived to be easy, fun, fair, excellent for class building at the start of the year and fosters the concept that everyone can work with everyone else. One particular disadvantage with random selection is that some groupings of students may lack the required skills for the task and this may be risky when the content is academically challenging (Brown and Thomson, 2000; Artzt & Newman, 2003).

Teacher selection (with heterogeneous grouping) has many advantages, it enables balanced teams with a mix of skills, abilities and perspectives and students acknowledge that it leads to better work habits and consistently produces better results. There are some disadvantages including the fact that it requires thought and planning and thus takes time, the process may also produce resistance from students, although they do generally come to accept it and prefer it (Brown and Thomson, 2000; Artzt & Newman, 2003).

It is proposed that the *Mixer-upper-er* falls into a new category. This will be discussed at the end of the paper, when this grouping method has been fully explained.

1. Use of the Mixer-upper-er

For social development it is worthwhile for students to mix and work with all members of their class. Generally students are organized into groups using teacher allocation or random allocation methods. Even with diligent management these methods will not ensure that all students have the opportunity to mix and work with all other members of their class.

The Mixer-upper-er is designed to enable each student to mix with all other students in their class over six different groupings. It works by arranging the class into five groups (Red, Orange, Yellow, Green and Blue – see Figure 1). There are six different combinations (Mix Columns) of these five groups which ensures that each student gets to work with all other students in their class. It works best for a class of 25, but will work for any class size below 25, and with some repetitions will work for class sizes above 25.

The "Mixer-upper-er" is designed to enable each student to mix with all other students in their class over six different groupings (Mix Columns). It works by arranging the class into five groups (Red, Orange, Yellow, Green and Blue). Detailed instructions can be found on the back of this chart.

Name	Mix					
	1	2	3	4	5	6
1.	Red	Red	Red	Red	Red	Red
2.	Orange	Orange	Orange	Orange	Orange	Red
3.	Yellow	Yellow	Yellow	Yellow	Yellow	Red
4.	Green	Green	Green	Green	Green	Red
5.	Blue	Blue	Blue	Blue	Blue	Red
6.	Red	Orange	Yellow	Green	Blue	Orange
7.	Orange	Yellow	Green	Blue	Red	Orange
8.	Yellow	Green	Blue	Red	Orange	Orange
9.	Green	Blue	Red	Orange	Yellow	Orange
10.	Blue	Red	Orange	Yellow	Green	Orange
11.	Red	Yellow	Blue	Orange	Green	Yellow
12.	Orange	Green	Red	Yellow	Blue	Yellow
13.	Yellow	Blue	Orange	Green	Red	Yellow
14.	Green	Red	Yellow	Blue	Orange	Yellow
15.	Blue	Orange	Green	Red	Yellow	Yellow
16.	Red	Green	Orange	Blue	Yellow	Green
17.	Orange	Blue	Yellow	Red	Green	Green
18.	Yellow	Red	Green	Orange	Blue	Green
19.	Green	Orange	Blue	Yellow	Red	Green
20.	Blue	Yellow	Red	Green	Orange	Green
21.	Red	Blue	Green	Yellow	Orange	Blue
22.	Orange	Red	Blue	Green	Yellow	Blue
23.	Yellow	Orange	Red	Blue	Green	Blue
24.	Green	Yellow	Orange	Red	Blue	Blue
25.	Blue	Green	Yellow	Orange	Red	Blue
26.	Red	Red	Red	Red	Red	Red
27.	Orange	Yellow	Green	Blue	Red	Orange
28.	Yellow	Blue	Orange	Green	Red	Yellow
29.	Green	Orange	Blue	Yellow	Red	Green
30.	Blue	Green	Yellow	Orange	Red	Blue

Figure 1. The Mixer-upper-er Poster (reproduced in black and white with permission from the publisher – GMLearning Skills).

Instructions for use of the *Mixer-upper-er*:

- Write your class list (alphabetically or otherwise) down the left hand column. If there are student combinations that you wish to avoid (e.g., Friendship groups or personality clashes) then cluster these students' names in a particular colour band from column 6 (i.e., 1-5, 6-10, 11-15, etc). In this way they will only ever be together in column 6 – pick your day, task and time for this mix!
- Organize your classroom into five table groups with at least five chairs at each grouping.
- Label each of the five table groups with a different colour (Red, Orange, Yellow, Green and Blue).
- Ask all students to read the table to identify the colour from the first mix column (Mix Column 1) that is beside their name. The first combination of students is formed when students move to their colour-coded table group.
- Repeat this process over successive lessons/weeks using the other mix columns (2 through to 6).

For a class of 25 or fewer students, there are no repetitions – everyone is always with a new group of students for all six groupings. Teachers who are familiar with the Jigsaw cooperative learning strategy (Murdoch & Wilson, 2004, p. 34) can implement this by using Mix Column 1 as the expert group and Mix Column 6 as the home group.

If teachers want their students to practise team roles (such as Recorder, Encourager, Speaker, Reporter, Manager, Time keeper, Observer, Gofer, Problem solver, Director) during the six different groupings, then a suggested arrangement (where each student is able to practise each role through the six groupings) is provided on the back of the poster.

2. The Mathematics Behind the *Mixer-upper-er*

When constructing the *Mixer-upper-er*, potential solutions can be found using an adaptation of the solution to the Handshake Problem.

The Handshake Problem

There are n people in a room. If everyone shakes hands with everyone else, how many handshakes, h , will take place?

Solution: With n people in a room they each shake hands with $(n - 1)$ people. Thus, there are $n \times (n - 1)$ handshakes but this counts handshakes between each pair of people twice, so we must divide by two:

$$\therefore h = \frac{n(n-1)}{2}$$

Applying the Handshake Problem to the Mixer-upper-er

If there is a class of size n , who are placed in groups of size g (where n/g is an integer), what is the minimum number of full-class mixes, C , that are required for every student to have worked in a group with every other student in the class?

Solution: For a group of size g , using the handshake problem solution, the number of within-group handshakes, w , is

$$w = \frac{g(g-1)}{2} \quad (1)$$

The number of handshakes, h , in the class of n students is

$$h = \frac{n(n-1)}{2} \quad (2)$$

If there are C full-class mixes of students with no repetitions of within-group handshakes (or groupings), then the total number of handshakes is also calculated by

$$h = w \times n/g \times c \quad (3)$$

By substitution of Equation 1 and Equation 2 into Equation 3, Equation 3 can be expressed as

$$\frac{n(n-1)}{2} = \frac{g(g-1)}{2} \times n/g \times c$$

and simplified to

$$c = \frac{n-1}{g-1} \quad (4)$$

Equation 4 provides the general solution to the problem and the value of C corresponds to the number of columns that are required in the mixer-upper-er. It can be used to check if there is a perfect solution to a particular class and group size. For example in the mixer-upper-er, the class size is 25 and the group size is 5, so

$$c = \frac{25-1}{5-1}$$

$$c = 6.$$

This correctly predicts that there needs to be six columns for each student to work in a group with every other student (assuming no repetitions of within-group handshakes).

Once this check has been performed, the actual solution can be constructed in a number of different ways.

3. The Pilot Study Trial

The pilot study aimed to answer four questions:

- Did the teachers use the Mixer-upper-er as a get-to-know-you tool?
- Did the teachers use the Mixer-upper-er in other ways?
- Would the teachers be willing to use the *Mixer-upper-er* again?
- What were the positives and negatives of using the *Mixer-upper-er*?

Sample

Twenty two Year 7 and Year 8 neighbourhood teachers at a regional Victorian secondary college trialled the *Mixer-upper-er* in their classes in 2007. Of these twenty two teachers, nineteen were surveyed in November 2007 —eleven Year 7 teachers, and eight Year 8 teachers.

Results

The results are summarized under headings based on the four research questions.

(i) Use of *Mixer-upper-er* as a get-to-know-you tool

Of the eleven Year 7 teachers, eight used the *Mixer-upper-er* as a get-to-know-you tool in their neighbourhood classes and of these eight six reported that their students responded positively to the tool and that the tool was effective. The three teachers who did not use the *Mixer-upper-er* as a get-to-know-you tool in their neighbourhood classes chose to use other activities for this purpose.

Only one of the Year 8 teachers used the *Mixer-upper-er* as a get-to-know-you tool in their neighbourhood classes and this teacher reported that their students responded positively to the tool. The other teachers believed that the students already knew each other very well and did not need to get to know each other.

As a get-to-know-you tool the Year 8 teacher only used it once, while the Year 7 teachers most often reported using the tool weekly (66% of respondents) and they used the tool for either all of Term 1 or for a series of weeks.

(ii) Use of *Mixer-upper-er* in other ways

Of the eleven Year 7 teachers, seven used the *Mixer-upper-er* in other ways beyond the initial get-to-know-you activities in their neighbourhood classes. Of these seven, six reported that their students responded positively to the tool and that the tool was effective.

Of the eight Year 8 teachers, seven used the *Mixer-upper-er* in other ways beyond the initial get-to-know-you activities in their neighbourhood classes. Of these seven, all seven reported that the tool was effective, while five reported that their students responded positively to the tool.

The other uses for the tool were to:

- Group students for learning tasks (Year 7 N=4, Year 8 N=5),
- Force students to work in groups other than friendship or self-selected (Year 7 N=2, Year 8 N=2),
- Break up naughty kids (Year 7 N=1)

The Year 7 teachers used the tool in other ways more frequently and for longer than the Year 8 teachers:

- Frequency of use was generally weekly for Year 7 teachers, and monthly for Year 8 teachers.
- Length of use ranged from months to the whole year for Year 7 teachers, and ranged from weeks to months for Year 8 teachers.

(iii) Willingness to use the *Mixer-upper-er* again

When asked if they would use the tool next year, eight of the eleven Year 7 teachers answered yes (one answered unsure and two answered no), while four of the eight Year 8 teachers answered yes (three answered unsure).

(iv) Negatives and Positives arising from the trial

The negative responses were based around two major themes:

- The “disastrous” group combinations, and
- The group size of five – some teachers preferred four.

The first negative response has been dealt with by modifying the teacher instructions to explain how this issue can be avoided in all but one arrangement of the class. The second negative response is being worked on at the moment — a new tool for group sizes of four is being constructed.

The positive responses were based around two major themes:

- Great tool to mix students outside their friendship groups, and
- That the tool is a great idea and works very well.

The majority of responses to the use of this tool were positive.

4. The 2008 Trial

The extended study targeted a larger population of staff and students at four different levels of education. The 2008 study aimed to evaluate the uptake and uses made of the *Mixer-upper-er* by teachers in this range of educational settings and contexts. In conjunction, the study evaluated student responses to the tool by assessing aspects of social development such as students' willingness to work outside friendship groups and the number of students each individual knows by name.

Sample

Four main groups of teaching staff and their students participated in this extended study (the study included teacher and student participants from educational levels which were considered as stages of transition for students):

- Teachers and students of one early/lower/upper level regional state primary school class
- Year 7 Neighbourhood teachers and students from one state Secondary College in regional Victoria
- Year 11 VCE Teachers and students at a regional Senior Secondary College
- Lecturers and 2nd year B Ed students at a regional Victorian University campus in their Science Teaching Practical classes

Results

Data from the 2008 extended trial is currently being analysed and these will be published at a later date.

Discussion/Conclusion

The pilot study used a full population of neighbourhood teachers at Year 7 and Year 8 level. Among this broad cross-section of teachers and students the *Mixer-upper-er* has generally received a positive response. The tool has been successfully used for get-to-know-you activities with classes, for grouping students for learning tasks, to force students to work outside their friendship groups and to break up naughty students. With some suggested refinements, there was adequate justification for a larger trial of this tool.

This tool seems to have potential social and educational benefits for students in all educational contexts. In recent years, educational research and policy development has highlighted the issue of student wellbeing as a priority, establishing strong links between

social development, social-emotional learning and intellectual/educational achievement. Physical, social and emotional development are viewed as integral to learning rather than incidental (McGrath, 2005; Vincent et al., 2005; CEOM, 2006). Accordingly, many school-based programs now aim to promote student resilience and social competence (See CEOM, 2006). In this context, the *Mixer-upper-er* can be seen as a useful technique to achieve initial forms of social mixing and interaction in various settings of student educational transition.

The *Mixer-upper-er* seems to fall into a new category for assigning students to groups. This tool is certainly not teacher or student selection, and it differs from random selection in two major ways. The first way it differs from random selection is that the teacher can intentionally separate students that they wish to keep apart (except for the final mix), and the second is that this tool ensures that all students have the opportunity to mix and work with all other members of their class. For these reasons, I propose that this is a new category for assigning students to groups and suggest that a suitable name for this category could be *systematic selection*.

References

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