

Investigating teachers' perceptions of open plan classroom settings: A case of an innovative convention?

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Informed by social cognitive theory, this study explores teacher perceptions regarding open plan learning contexts, with foci on academic outcomes, social interaction, the accommodation of students with additional learning needs, and how to manage administrative tasks, within this non-traditional context. This quantitative study was facilitated by the development and design of a scale to measure teacher perceptions regarding open plan learning. In the initial stage of the project, a scale was developed, drawing on key elements from a comprehensive literature review, first within Australian settings, and then internationally. The focus of the project was on how individual teachers, within their school contexts and dynamics, perceived open plan settings, and of how they managed the learning programs of their students. The survey gathered information more broadly, relating to the efficacy of the open plan learning context for all students and teachers. Directed at a group of educators, who had taught both in open plan settings and who had accommodated students with additional learning needs, the study considered individual responses, noting levels of confidence and of how school factors shaped perceptions of open plan classrooms. The study yielded an instrument comprising four subscales, with a total of 42 items, encompassing academic, social, students with additional needs and administration elements. Results revealed that teachers in larger schools held more positive perceptions toward open plan classrooms, and those who had experienced prior success in these settings appeared to consider these contexts more favourably. The scale will be useful to school administrators and school leaders, who want to explore the perceptions of their staff towards open plan classrooms.

Introduction

The 1970s in Victoria, Australia, saw a significant shift to open plan learning spaces in schools and while this trend faded there has been a re-emergence and a re-examination of pedagogical approaches and how best to use educational spaces (Department of Education and Early Childhood Development Victoria, 2011; Gislason, 2009). After the global financial crisis, Australia's federal government responded by injecting money into the community and one of these projects was the 2008 *Building the Education Revolution – primary schools for the 21st century*. In 2009, the Australian Federal Government released its *Building the Education Revolution* program and supported this with A\$16.9 billion to be allocated to refurbishing and building school environments with 'innovative designs'. Aligned with this was the release of complementary documents outlining the benefits of flexible learning spaces. This trend continued toward the design of flexible learning spaces in a move to accommodate the twenty-first century learner (Bradbeer et al., 2017; Saltmarsh et al., 2015), fostering skills such as creativity, collaboration, communication and critical thinking.

Research conducted by the Organisation for Economic Cooperation and Development (OECD, 2010) into innovative learning environments (ILE) has been translated into practice in 25 countries. These ILE have also been referred to as open plan spaces and flexible learning environments and typically describe educational delivery through open and accessible spaces, that are aesthetically pleasing, comfortable and involve an integration with technology (Deppeler & Aikens, 2020). As a consequence, these spaces are arranged to encourage multiple means of learning and teaching, to improve the overall student experience (Deppeler & Aikens, 2020). Innovative learning environments (ILE) are viewed as creatively designing the environment to increase student voice and teacher voice (Alterator & Deed, 2018; Byers et al., 2018a, 2018b). Imms (2018) also noted that the time of classrooms being furnished with rows of desks, with the teacher at the front, has passed, going on to add that financial support for these innovations would be more judiciously allocated if they had been appropriately researched and based on evidence-based practice. The comment, 'The problem is that the train has gone ahead, and designs are not always based on the best evidence', rings true (Australian Research Council, 2018).

A classroom is a complex space, with students transiting in and out in varying numbers, which can impact on the acoustics, heating and lighting of a classroom. Teachers using the same room, particularly in high schools, can have vastly different pedagogical approaches and behavioural expectations. The space as a place of importance is vital (French et al., 2019). The ILE classroom can be designed in multiple ways, with moveable walls and furniture, with teachers sharing the space. It is centred on the learning of the student and the collaboration of the teachers in regards to their pedagogical approaches and implementation. It is social and yet also personalised for the student (OECD, 2010), ready for the students of the 21st century; there is the realisation of the importance of the ILE and its move from teacher-centred spaces to learner-centred (Oblinger, 2005). The emerging research on the impact of flexible learning spaces on student achievement indicates there is a positive link (Byers et al., 2018a, 2018b; Byers & Lippman, 2018). In these open plan learning spaces, as the walls come down, students can become more independent learners, with the need to develop 'self-regulatory' and 'self-reliant' behaviours (Charteris et al., 2017), and having more than one teacher in the classroom can enable one-on-one support with more individualised learning and also expanded teacher expertise, yet research is slow to address the inclusion of students with diverse needs in these spaces (Deppeler & Aikens, 2020). Woolner et al. (2014) conducted a case study in a school that had moved toward open learning spaces and found that teachers struggled with the collaborative teaching and joint planning and school leaders had not anticipated the extent of the required changes and some students struggled if the acoustics are not a factor in the set-up of the classroom, potentially adversely impacting their academic achievement, particularly students with additional learning needs (Woolner et al., 2014). In a review of research conducted over 40 years into noise in open plan classrooms, it was determined that 'intrusive noise' has been a major issue (Shield, Greenland & Dockrell, 2010). Students with a hearing impairment, students with English as an additional language or students who have sensory issues such as children on the autism spectrum or who have ADHD, are more impacted by the acoustics of the classroom than their peers without additional learning needs (Connolly et al., 2015). Also, younger children are less

skilled as listeners when there is background noise and require an acoustically appropriate space (Mealings et al., 2015).

The emerging research in the field of ILE tends to focus on the actual physical space rather than the 'alignment between spaces and desired educational practices, activities and behaviours' (Cleveland & Fisher, 2014), yet the notion of the design of the learning space by architects must consider functionality over aesthetics. The social model of disability posits that a disability is as a result of an inappropriate environment and we as a society need to remove as many barriers as possible (Hamraie, 2017). In Australia, the *Disability Standards for Education* (Australian Government, 2005) clarifies educational and training obligations under the Federal legislation of the Disability Discrimination Act (1992). These relate specifically to how education and training will be made accessible to students with disability and cover: enrolment; participation; curriculum development, accreditation and delivery; student support services; and elimination of harassment and victimisation (Australian Government, 2005). The open plan learning environment and the requirements of students with disability needs to be a consideration of architects, school administrators and teachers, if these are to be inclusive learning spaces.

Key findings from the LeARN (Learning Environments Applied Research Network) project through the University of Melbourne discovered that the physical learning environment can have an impact on teaching and learning and that with a considered design there is potential to increase student engagement and achievement (Byers & Imms, 2018), but the actual physical space and the mindset of the teacher is a crucial variable as is their ability to work with colleagues. While the school building process is complex, with an eye to how the design of the building can be flexible to accommodate different needs (Daniels et al., 2022; Tse et al., 2015), there has been too little research into how the architecture of a school effects a teacher's pedagogy (Gislason, 2009), yet what is needed for the success of these less traditional approaches is support from teachers and administrators, professional learning opportunities, time and resourcing (Gislason, 2009). While the research is suggesting that innovative learning environments can have a positive impact on student learning and staff wellbeing, this is not always realised in actuality and the reason may be that there is a disconnect between the developers of the school design and the users (Deppeler & Aikens, 2020).

At the coalface, teachers are the key to the success of these inclusive innovative learning spaces. This research intends to provide a representation of the voices of 33 educators teaching students with diverse learning needs in open plan learning spaces in schools in Victoria, Australia. The teachers were Located in both primary and secondary schools, in a range of roles and positions, from a new graduate to experienced teachers. With progress towards inclusive education, where every child has the opportunity to learn alongside their peers in mainstream schools in their local communities (UNESCO, 2013), the inclusion of students in these open plan spaces was also a focus of this research, as there is also a lack of research into personalised learning for students (Prain et al., 2013).

How do open plan classrooms differ from traditional classrooms?

Open plan classrooms often accommodate larger numbers of students, possibly up to 90, and involve team-teaching initiatives with up to 4 teachers (Henebery, 2015; Mealings, Demuth, Buchholz & Dillon, 2015). The layout of the classroom is different from a traditional classroom, with greater flexibility with regard to the use of space (Henebery, 2015; Mealings et al., 2015). In an open plan classroom, walls or partitions are often removed to accommodate greater collaboration and interaction among students and staff (Mealings, 2015). Unlike the traditional classroom of about 30 students with one teacher, the open plan classroom houses many students in one area, intended to contribute to greater social development among students (Mealings, 2015). Additionally, open plan classrooms are perceived to be less authoritarian, and may contribute to more effective group work in a more cooperative atmosphere (Mealings, 2015). The teaching and learning space is not defined in an open plan classroom, and it is suggested that students in these settings have greater autonomy compared to more traditional settings (Harper, 2018).

The significance of this study

Open plan classrooms are becoming increasingly popular within contemporary schools, with several learning institutions believing that these learning environments are conducive to more effective interaction and are more likely to result in positive academic outcomes. In Australia, the Rudd Government's *Building the Education Revolution* program saw many schools utilise this public investment to create classroom spaces that embraced open plan settings (Byers & Lippman, 2018). There is some research available with regard to the impact of open planned learning on student outcomes (Henebery, 2015), and other research focuses on how teachers interact together within these learning spaces (Alterator & Deed, 2018). However, there is minimal research which focuses on the individual teacher and of how certain demographic variables may shape and influence their interaction and responses to other staff and students within the open plan classroom. As a pilot project, this study is therefore significant in two ways. Firstly, this study is focused on individual classroom teachers and their responses to open plan learning contexts with regard to their confidence, previous success, and their ability to manage student behaviour within open plan classrooms. Secondly, this study aims to create a usable instrument which can be used by educational administrators and school leaders to determine the level of comfort experienced by individual teachers interacting and teaching within open plan settings.

The research therefore is twin-pronged, hoping to garner quantitative feedback about individual teacher reactions and responses within open plan settings, and secondly to test an instrument which can be valuable in ascertaining views about how teachers perceive open plan classrooms. The instrument which is comprised of four parts, can be used holistically or discretely, as a test to gauge teachers' perceptions within open plan classrooms. It collectively draws opinions regarding how the open plan classroom facilitates the meeting of academic outcomes, how it facilitates social interaction between

and among students, how it accommodates students with additional learning needs, and of how it assists with meeting administrative requirements.

Prior to commencing data collection, ethical approval was obtained from the Monash University Ethics Committee and from the Department of Education Victoria.

Research questions

As a pilot study, the exploration of teachers' perceptions of open plan learning contexts was directed by the following research questions:

1. What are teachers' perceptions of open plan learning in Victoria, Australia?
2. In what ways do selected demographic variables impact on these perceptions?

These two main questions capture the main phenomena under investigation, incorporate the context and hone in on the population under consideration.

Conceptual framework

This study was framed by Bandura's *Social Learning Theory* (SLT), which is a cognitive model that considers how both environmental and cognitive factors interplay to shape and influence human learning and behaviour (Bandura, 1977b). Bandura (1977) built on the idea of radical behaviourism by adding two significant features to learning with others (Bandura, 1977a). Firstly, he acknowledged that there is a mediating process which features between the stimulus and the response, and secondly that behaviour is often gleaned from the environment, often through the process of observational learning (Bandura, 1977a). Within the context of this study, the focus is on the perceptions of teachers regarding the ability to teach and manage behaviour within open plan classrooms. Teachers in open plan classrooms are often interacting with other staff and their students in order to create an environment conducive to learning, within this innovative and non-traditional environment. As a consequence, teachers are the recipients of a range of external stimuli including the behaviour of other educators, support staff, and children. This process of attending to and sometimes imitating other individuals, leads to certain expectations and behaviours within the setting. Furthermore, teachers are often responsive to the behaviour of others, and are likely to continue performing behaviours based on certain types of reinforcement. If teachers meet with success and their students achieve academic outcomes within these contexts, they are likely to continue teaching effectively within this setting, and enhance their skills.

Reinforcement therefore occurs externally; however, it may impact on internal values and beliefs. Teachers are also exposed to and observant of other educators within such contexts, and are therefore likely to repeat behaviours that are working for others within the context of open plan learning. Bandura called this vicarious reinforcement. Teachers are likely to observe specific behaviours and mannerisms in other teachers and support staff that produce outcomes which they consider to be satisfactory or gratifying. As a

result, they are likely to adopt these observed behaviours, and attitudes, especially if “the model” whom they are observing possesses qualities which they find appealing. This internalising or adoption of another’s behaviour is not conscious, especially within a setting like open plan learning where the dynamics are often quite vibrant and active. Bandura’s *Social Cognitive theory* (1977) is often used within the process of student learning, however, within the context of open plan learning, this research acknowledges that teachers are often participants in the learning process as much as their students are.

Scale construction

The scale was constructed in line with key criteria recommended regarding scale validity and construction. Four conceptual factors were considered in the construction of the scale, in order to ensure academic rigour (Carmines, 1979; DeVellis, 2017; Fink, 1995).

Face validity

The appearance and overall presentation of the scale was considered in order to maximise appeal to potential respondents (Carmines, 1979; Fink, 1995). Given that the scale was targeted at school teachers, attempts were made to increase its visual appeal using appropriate formatting and colour. It also offered respondents a reasonable platform to articulate their views on open plan learning within contemporary contexts (Zeller & Carmines, 2013). At the outset the research team explored several available sources, which provided information on open plan learning contexts, and the accommodation of students with disabilities into these settings. Aligned with scale development, this initial perusal of the literature yielded an extensive pool of items, which embraced relevant ideas and views gleaned from research studies, opinion pieces, reports, and anecdotal evidence drawn from the Internet (Morgado et al., 2017). Efforts were made to include as many ideas as possible, especially since a scale of this nature was not developed previously within an Australian context. Additionally, the lived experience of both the researchers, who are also educators in the field, informed the selection of initial items for the preliminary pool. This background knowledge allowed the team to word and reword items, enlightened by not just their own experiences, but through conversations with teachers and researchers in the field. Through deductively and inductively examining this initial pool, the research team was able to identify pertinent elements, to construct a comprehensive pool of items, representing a range of ideas related to open plan learning contexts (Boateng et al., 2018). The preliminary scale generated a final pool of 42 items.

Construct validity

The study combined the theoretical underpinnings of Bandura’s Social Learning Theory, Bronfenbrenner’s social ecological model, and the underlying tenets of Vygotsky’s social cultural theory. Informed by these major constructs, the scale embedded specific word choices, incorporating relevant verbs linked to these paradigms, to elicit accurate responses from participants. In considering structural validity, the recommendations of De Vellis (2017), Carmines and Zeller (1991) and Fink (1995) were considered during scale construction. The scale was divided into four sections – academic; social/collaboration; students with additional learning needs, and administration. In the

academic section, the scale explored the impact of open plan learning on teaching and assessment strategies. The section on social interaction explored ideas around the environment, and the cooperative learning context facilitated by an open plan setting. An important layer of this research was the accommodation of students with additional learning needs within open plan settings - the third section therefore explored participant views regarding the adjustment within the open plan classroom for students with diverse learning profiles. The final section in the scale considered how open plan classrooms were organised and structured to accommodate both teaching and learning programs.

Content validity

Following the guidelines associated with scale development and design, the initial scale was subject to the examination of an expert panel (Carmines, 1979; DeVellis, 2017). The contribution and examination of an expert panel allowed for an exploration of whether the scale met its objectives and measured what it set out to measure. The expert panel included teachers and university academics who were familiar with open plan learning contexts and scale development. Opinions were also sought from individuals outside of the discipline, so that items within the scale could be scrutinized more objectively. The expert panel was provided with a short checklist in order to assist their perusal of the overall scale. This checklist included elements such as the precision of wording, the use of jargon, an exploration of the purpose of the scale and how this played out in individual items, and its length and appropriateness.

Criterion related validity

The *Social Sciences Statistical Package* (SPSS) v.22 was utilised to determine its overall validity, employing specific statistical procedures. The validation of the scale will occur through a series of steps, including the process of exploratory factor analysis. This process will assist in reducing the number of items. Cronbach's alpha was determined at the outset, prior to factor analysis.

Survey design

The main objective of the scale was to quantify teacher perceptions of open plan learning. Scale design utilised the criteria cited previously (face, construct, content and criterion validity). The final scale consists of five parts:

- Academic (9 items) - which explored teacher perceptions about how student outcomes were met academically, including student achievement, concentration and collaboration.
- Social (20 items) - investigated social interaction and collaboration within the open plan setting, including skill development among the teaching team, and innovative teaching approaches used within the setting.
- Students with additional learning needs (8 items) - sought the views of teachers with regard to the accommodation of students with diverse learning profiles into the open plan classroom.

- Administration (5 items) - considered how the structure and organisation of the open plan classroom created opportunities for more efficient use of time, resources and physical space.
- Demographic details – 15 questions were included at the end of the scale which obtained demographic data including gender, age qualification and school location.

In total, the four sub-scales included 42 items. Directed by the scale design recommendations of De Vellis (2017), the following process informed the development of the survey:

1. The construction of an initial scale consisting of a pool of items developed to assess teachers' perceptions of teaching within open plan settings.
2. The perusal of the scale by a small group of educators who served as the expert panel.
3. The use of exploratory factor analysis and other reliability analyses (Cronbach's alpha) to ensure internal consistency.

Data analysis

Analysis of missing data

There was evidence of missing data across the data set. The research team opted for the use of the expectation maximisation technique, an effective means of addressing missing responses. Missing data could have been due to non-response or some respondents dropping out of the survey. In order to determine whether to maintain the existing sample, and to explore whether data was missing at random, some procedures were carried out using SPSS. Little's *Missing Completely at Random* (MCAR) test was performed through SPSS and indicated two questions to be problematic – items 36 and 40. Question 36 (Students with hearing impairments cope well in an open plan setting.) and Question 40 (The walls of our open plan classroom have been acoustically treated to accommodate the varying sound levels.) were frequently omitted by respondents. Little's MCAR Test returned a non-significant result (Chi-square = 28.73, sig = 1.00), suggesting that the data was otherwise randomly missing. Subsequently, the use of the expectation maximization technique was effective in addressing missing scores for this study.

The pilot study

The target population for the study were in service teachers who were involved in open plan or flexible space teaching, in Victoria. A total of 33 in service teachers returned usable surveys. Given that this was a pilot study, the research team accepted a smaller respondent base, with a view to using the responses to refine the survey. In this case, the pilot study was fundamentally utilised as a means to reduce the number of scale items, to allow for a shorter form of the survey. Research supports the view that pilot studies should act as precursors to larger, validation studies, to identify possible drawbacks or gaps in the instrument, and to assist with refining the research design (Jairath et al., 2000; Moore et al., 2011). Pilot studies are generally used to test, on a small scale, to facilitate refinements and revisions of a larger scale (Ackerman & Lohnes, 1982; Engle, 1989). In addition, the current study was also viewed as a feasibility study which would offer the

research team an opportunity to refine and reduce the scale before administering to a wider population of respondents (Cope, 2015).

Designing and assessing a scale in this manner guarantees success of a broader project used to validate the instrument (Cope, 2015). As a consequence, this pilot study was used to test (Prescott & Soeken, 1989), determine the ability of the scale to answer the research questions (Prescott & Soeken, 1989), and to assess the feasibility of the measure (Leon et al., 2011). In a similar study assessing the efficacy beliefs of teachers toward culturally and linguistically diverse students, Chu (2013) utilised a sample of 31 teachers to examine the reliability of a newly developed instrument. As a consequence, the research team found the current sample (n=33) to be adequate to test the feasibility of the survey to assess teachers' perceptions of open plan classrooms. The pilot study would therefore offer the team an opportunity to detect design issues, refine the scale and gather important data from a representative sample before administering the scale to a larger population of participants.

The preliminary scale

The preliminary *Teachers Perceptions toward Open Plan Learning Spaces* comprised 42 items, divided over four subscales. The scale was preceded by the following explanation:

The TPIESS (Teachers Perceptions toward Open Plan Learning Spaces) measures the perceptions of school teachers toward the use of open plan learning spaces. Open plan learning spaces refer to the combined teaching of larger groups of students, often involving multiple teaching personnel. It is a departure from the single cell classroom, usually requiring larger physical spaces and flexible, open plan environments.

For each item on the scale, respondents were asked to indicate their response to one of five forced choice replies. The Likert anchors were: 1=Strongly disagree; 2=Disagree; 3=Neutral; 4=Agree; 5=Strongly agree. 1=Strongly disagree; 2=Disagree; 3=Neutral; 4=Agree; 5=Strongly agree.

The 5-point Likert was viewed as preferable since scales with seven-point anchors are sometimes viewed as onerous, and result in frustration for the respondent (Babakus & Mangold, 1992), and a subsequent abandonment of the survey. In order to ensure that the scale was suitable for factor analysis, the data was examined using the communalities table in SPSS. Communality scores measure the ratio of an item's variance to the shared variance within the scale in its entirety. Items with lower scores may not be contributing constructively to the scale, and may need to be removed following a pilot study. However, all items on the preliminary scale indicated communalities of above .7, indicating very strong relationships between items. As a consequence, it was decided that the scale was sufficiently valid to be used to measure perceptions regarding open plan learning, and satisfactory for further analysis. Respondents who produced higher scores would indicate more positive perceptions of open plan learning, while those with lower scores would likely indicate more negative attitudes.

Descriptive statistics of participants

A total number of 33 participants returned usable surveys which could be used as part of this pilot study. Of these, there were 24 female participants (73%), and 7 male participants (21%). Two respondents did not indicate gender. There was an even spread of respondents across age categories, with 9 participants aged under 30 (28%), 11 between 31 and 40 (33%) and the remaining number being over 40 (39%). Most participants held the qualification of a bachelor degree (n=23), accounting for 70% of respondents, with 6 (18%) indicating that they held higher degrees such as masters qualifications, and 4 indicating that they held qualifications that were less than a bachelor qualification (12%). Most respondents in this pilot study taught in primary schools (n=20) accounting for about 61% of the respondent base, with 1 respondent indicating that they taught largely within the pre-school sector and 12 (36%) indicating that they taught in secondary schools. There was a stable spread of participants with regard to the number of years they were in the teaching profession. Nine teachers (27%) indicated that they were in the profession for less than 5 years, 12 were in the profession for between 6 and 15 years (36%) and the remaining 12 (37%) had been teaching for more than 16 years. Six respondents accounting for 18% of the respondent base indicated that they had been teaching for more than 25 years. The majority of respondents taught in suburban schools (n=15) and accounted for 47% of the respondent base. Five respondents were situated in urban/metropolitan (16%), with 12 in regional or rural areas (37%).

Most respondents taught in state or government schools (n=26), explaining 79% of the respondent positions, with the remaining 21% teaching in independent schools. While there was a broad spread of school sizes, most respondents in this study noted that they taught at schools with less than 300 students (n=19; 58%), with just 6% (n=2) acknowledging that their schools accommodated over 1200 students. When asked about the total number of students accommodated in an open plan setting, the majority indicated that there were above 40 students in this type of learning environment, describing 82% of the total responses. Typically, most respondents (n=26) acknowledged that larger groups of students within open plan settings required between 1 – 3 staff, describing 79% of responses, with 21% (n=7), noting that more than 3 teachers were required in these settings. The large majority of participants had previous experience with teaching in open plan classrooms (n=25, 76%), with just 8 respondents acknowledging no experience in this type of setting (24%). There was a division of scores when respondents were asked about how they would rate their success with teaching in open plan settings. About 46% (n=15) suggested that they thought their endeavours were “Average”, while 54% (n=18) thought that their teaching in these setting was “Highly” successful. Similarly, when questioned about their level of confidence when teaching in an open-plan setting, only one participant indicated low confidence. About 40% of respondents indicated “Average” degrees of confidence (n=13), and 58% (n=19), implied that they felt “Highly” confident teaching in open plan classrooms. Surprising, 88% (n=29) of the respondents reported that they had undertaken no professional development to equip them to teach in open plan settings, with only 4 participants undertaking professional learning of some sort, accounting for just 12% of the respondents.

Initial reliability analysis

The total scale contains four subscales which can be used both holistically and discretely. Table 1 notes the Cronbach's alpha scores of the subscales and the number of items in each subscale. Cronbach's alpha scores should ideally exceed .7 (DeVellis, 2017; Tavakol & Dennick, 2011). The subscale exploring the academic impact of open plan classrooms and the subscale exploring the impact of this setting on students with additional learning needs yielded high internal reliability scores. However, the subscale investigating the social impact of open plan classrooms and the associated administrative impact yielded marginal reliability scores.

Table 1: Internal reliability scores per subscale

Subscale	Academic	Social	Students with additional learning needs	Administration
Number of items	9	19	8	5
Cronbach's alpha	.89	.64	.91	.53

Results

As a pilot study, the exploration of teachers' perceptions of open plan learning contexts was directed by the following research questions:

1. What are teachers' perceptions of open plan learning in Victoria, Australia?
2. In what ways do selected demographic variables impact on these perceptions?

These two main questions capture the main phenomena under investigation, incorporate the context and hone in on the population under consideration. The results are presented in line with the four subscales to ensure more accurate reporting of the findings. As pointed out earlier, higher scores in the subscales are indicative of more positive perceptions toward open plan learning, while lower scores would be suggestive of more negative perceptions.

Academic

Table 2 presents the statistically significant mean scores of the "Academic" subscale. Statistically significant mean scores were evident between respondents according to school size, with those from larger schools ($M=3.82$, $SD=.64$) reporting more positive perceptions with regard to the academic outcomes in open plan classrooms, compared to their counterparts in schools with smaller populations ($M= 3.28$, $SD= 0.55$). In this subscale, respondents who reported high levels of success associated with previous experiences with teaching in open plan settings reported more positive perceptions compared to those who indicated "Average" levels of success. Those with high success ($M=4.05$, $SD=.51$), compared more favourably to those with lower success levels ($M=3.27$, $SD=.56$), in the context of academic outcomes within open plan settings. The other demographic variable which produced a statistically significant different in mean

scores was in relation to confidence levels. Respondents with Average confidence ($M=3.34$, $SD=.57$) reported more negative perceptions of open plan classrooms, compared to respondents who indicated High confidence ($M=3.98$, $SD=.57$) with achieving high academic outcomes among their students.

Table 2: Statistically significant mean scores per academic subscale

Demographic variable		N	Mean	SD	Sig. (p)
School size	301-600	8	3.28*	.55	.038
	601-900	25	3.82*	.64	.038
Success	Average	15	3.27*	.56	.00
	High	18	4.05*	.51	.00
Confidence	Average	14	3.34*	.57	.006
	High	19	3.98*	.57	.006

Social

Table 3: Statistically significant mean scores per social subscale

Demographic variable		N	Mean	SD	Sig. (p)
School location	Urban/metro	5	4.53	.38	.079
	Suburban	15	4.41	.94	.079
	Regional/rural	12	3.83	.45	.079
School size	301-600	8	3.72	.66	.032
	601-900	25	4.36	.72	.032
Class size	20-40	6	5.30	1.12	.007
	More than 60	9	4.33	.32	.007
Success	Average	15	3.86	.97	.012
	High	18	4.50	.32	.012
Confidence	Average	13	3.90	1.03	.058
	High	19	4.46	.35	.058

Respondents from urban/metro schools ($M=4.53$, $SD=.38$) indicated more positive perceptions to open plan learning with regard to social outcomes for students, compared to respondents who taught in suburban or regional/rural areas. Those respondents from inner city schools tended to have significantly more positive perceptions of opening plan teaching and learning compared to teachers who were located in suburban ($M=4.41$, $SD=.94$) or regional settings ($M=3.83$, $SD=.45$). Similarly, respondents from larger schools with student populations in excess of 600 tended to have more positive perceptions regarding social outcomes for students in open plan classrooms ($M=3.72$, $SD=.66$) compared to their counterparts in smaller schools ($M=4.36$, $SD=.72$).

There was also some variance with regard to class size. Respondents appeared to favour smaller classes with those accommodating from 20 to 40 students indicating much higher mean scores ($M=5.30$, $SD=1.12$) regarding teaching in open plan settings, and its subsequent impact on social outcomes for students, compared to teachers who were accommodating more than 60 students in their open plan classrooms ($M=4.33$, $SD=.32$).

Additionally, respondents who indicated average success ($M=3.86$, $SD=.97$) with open plan teaching and learning programs evidently had lower perceptions regarding successful social outcomes for students in open plan settings, compared to other teachers who indicated high levels of success with regard to social outcomes for the students in open plan settings ($M=4.50$, $SD=.32$). Similarly, teachers who indicated high degrees of confidence with instructional programs in open plan settings ($M=4.46$, $SD=.35$) had significantly more positive views of how these settings could accommodate better social outcomes for students. Those respondents with average levels of confidence produced statistically lower means ($M=3.90$, $SD=.35$) suggesting that social outcomes for students, were not likely to be met in this type of setting.

Students with additional learning needs

Table 4: Statistically significant mean scores per students with additional learning needs subscale

Demographic variable		N	Mean	SD	Sig. (p)
School location	Urban/metro	5	3.73	.19	.090
	Regional/rural	12	3.05	.53	.090
School size	301-600	8	2.98	.66	.061
	601-900	25	3.52	.69	.061
Class size	20-40	6	2.91	.50	.083
	41-60	18	4.21	.07	.083
Success	Average	15	2.90	.58	.000
	High	18	3.80	.54	.000
Confidence	Average	13	2.99	.56	.005
	High	19	3.71	.65	.005

Respondents from inner city schools ($M=3.73$, $SD=.19$) appeared to have better perceptions of open plan learning when it came to accommodating students with additional learning needs. Their counterparts in regional schools ($M=3.05$, $SD=.53$) appeared to have fewer positive perceptions of how to accommodate students with additional learning needs within these settings. Additionally, respondents from larger schools with student populations in excess of 600 tended to have better perceptions of open plan learning contexts ($M=3.52$, $SD=.69$) when it came to catering for the needs of students with additional learning needs. Teachers from schools with populations of 300-600 students ($M=2.98$, $SD=.66$), tended to have lower perceptions of how students with additional learning needs could be accommodated in open plan classrooms. Class size appeared to be another demographic factor contributing to teachers' perceptions of open plan classrooms. Interestingly, teachers with large classes in excess of 40 students ($M=4.21$, $SD=.07$) had better perceptions of accommodating students with additional learning needs while their counterparts with smaller classes (20-40 students) ($M=2.91$, $SD=.50$), tended to have greater reservations about accommodating students with additional learning needs. Success was another contributory variable with respondents who indicated high levels of success in open plan settings ($M=3.80$, $SD=.54$) possessing better perceptions of open plan teaching and learning programs, compared to those with

average levels of success in the same setting ($M=2.90$, $SD=.58$). Finally, in the subscale considering the accommodation of students with additional learning needs in open plan classrooms, teachers with high levels of confidence ($M=3.71$, $SD=.65$) tended to have more positive perceptions compared to those who indicated average degrees of confidence ($M=2.99$, $SD=.56$).

Administration

Table 5: Statistically significant mean scores per administration subscale

Demographic variable	N	Mean	SD	Sig. (p)
School location				
Urban/ metro and Suburban	20	3.75	.64	.065
Regional/rural	12	3.22	.50	.065

Respondents in urban and suburban schools ($M=3.75$, $SD=.64$) tended to have better perceptions of open plan learning with regard to administrative responsibilities within the setting. Other respondents from regional and rural schools ($M=3.22$, $SD=.50$) indicated lower perceptions about fulfilling administrative duties when teaching in open plan classrooms.

Discussion

The focus of this study was to explore teachers' perceptions of open plan learning, examining some of the demographic variables which could impact on these perceptions. The results from this study reported statistically significant means, according to the four subscales: academic, social, students with disabilities, and administration.

Results illustrated that respondents from larger schools reported more positive perceptions with regard to the academic outcomes in open plan classrooms, compared to their counterparts in schools with smaller populations. Larger schools are likely to be better resourced, have more staff within classrooms to support open plan learning and teaching, and are therefore able to share the workload. Fletcher and Everatt (2021) in a New Zealand based study which explored the perceptions of pre-service teachers in relation to innovative learning environments (such as open plan learning) noted that the more staff that were assigned to a group, the more likely it was for students to receive appropriate attention. The study noted that a great deal depended on how an environment was staffed, and this often was linked to leadership decisions (Fletcher & Everatt, 2021). It follows that in large schools, where funding may be higher, that it is likely that more staff could be assigned to open plan classrooms, easing the academic burden, and allowing for more individualised support of students. Additionally, with regard to meeting student outcomes from an academic point of view, teachers who reported high levels of previous success in open plan settings appeared to hold more positive perceptions. Previous successful experiences are likely to facilitate greater self-efficacy beliefs. Self-efficacy is linked to personal beliefs to execute a certain course of action (Artino Jr, 2012), and in this context, teachers are likely to experience greater motivation in the context of open plan learning if they have experienced previous success in this context. Additionally,

respondents with significant degrees of confidence appeared to have better perceptions of meeting academic outcomes for their students, compared to those who had lowered degrees of confidence. Confidence, like success, generally creates a solid platform from which teachers could experiment with and practice more innovative measures. Open plan learning often requires teachers to be creative, especially since they are accommodating large student numbers. Here too, the connection to self-efficacy is quite apparent. Self-efficacy beliefs pertain to the confidence one has in one's ability to perform certain tasks or skills (Bandura, 1977b). Studies reveal that confidence is a powerful predictor of success (Beatson et al., 2020), and in this context it is evident that teachers who feel that they cannot enhance student output academically almost likely able to achieve these goals.

With regard to meeting students' social outcomes, respondents from urban/metro schools indicated more positive perceptions to open planned learning compared to those who taught in suburban or regional schools. Inner-city schools are likely to be better resourced, employ more staff, and draw on different layers of funding in order to support innovative learning environments such as open plan learning. Schools in the inner city are also more likely to have access to better buildings and equipment to support open plan teaching and learning programs, compared to schools that may be in more regional areas. Interestingly, one study noted that the noise levels in open plan classrooms could impact on social interaction and compromise communication (Shield, Greenland & Dockrell, 2010). Research appears to suggest that in large open plan settings, noise reduces understanding and privacy (Shield et al., 2010). It is likely that teachers create different forums for students to interact in inner-city schools which may be facilitating social interaction. Additionally, respondents from larger schools with student populations in excess of 600, tended to have more positive perceptions regarding the social outcomes for students in open plan classrooms compared to teachers in smaller schools. Larger schools are likely to have access to more staff and better resources. In one study, in an urban school, the researcher noted that in larger schools, there was decreased teacher isolation and more shared ownership of student learning (Bradbeer, 2011). It is likely therefore that greater collegiality in open plan settings, paved the way for more positive views of teaching in this context.

Respondents appeared to favour smaller classes regarding teaching in open plan settings compared to those classes with more than 60 students, who were being accommodated together. Smaller classes are consistent with traditional class sizes and are more likely to be managed better with regard to teaching and discipline. Research with regard to open plan settings interestingly revealed that some teachers experience confusion about how to share instructional time and responsibilities within these settings (Bradbeer, 2011). Occasionally, there could be a variance with regard to teaching philosophies which could lead to tension. However, the same study alluded to the view that collective expertise generally resulted in greater effectiveness with a range of student abilities (Bradbeer, 2011). Additionally, aligning with results obtained with regard to academic outcomes, respondents with successful previous experience in open plan settings had more positive perceptions of these learning environments compared to those teachers who had not indicated high levels of previous success. Similar to meeting the academic outcomes of students, those staff with successful previous experiences, possibly felt more comfortable

with accommodating social interaction among students, as they had developed confidence in their ability to manage these settings. Likewise, teachers who indicated high degrees of confidence with instructional programs like open plan classrooms had more positive perceptions of how these settings could better accommodate social outcomes for students, compared to their counterparts who had unlimited levels of confidence. Research reveals that the personalities of teachers could be a contributing factor determining how teachers interact in the open plan classroom (Oseland et al., 2018). Some teachers may be motivated and spurred on by the busy environment, while others may find that they interact better with students in smaller groups. The study noted that both introverts and extroverts may find comfortable spaces within open plan learning contexts (Oseland et al., 2018).

A focal point for the current study was the accommodation of students with disabilities and additional learning needs within open plan classrooms. Again, respondents from inner city schools held better perceptions of open plan learning with regard to accommodating students with additional learning needs. Teachers from larger schools also tended to have more positive perceptions of open plan learning contexts compared to those with smaller student populations. This was in relation to the accommodation of students with disabilities and additional learning needs. Again, teachers in larger classes in excess of 40 students, seemed to have better perceptions of accommodating students with additional learning needs compared to those who were managing smaller classes. Success and confidence in this context were also prevalent factors determining positive perceptions with regard to accommodating students with disabilities into open plan settings. In a study of open plan learning settings in kindergarten, Mealings et al. (2015) observed that students could not hear properly in these contexts and this led to compromised comprehension and speech perception (Mealings et al., 2015). Other research notes that mainstream schools, which accommodate all students, are no longer traditional, and that with appropriate professional development, new teachers will be able to manage innovative settings such as the open plan classroom (Imms, 2018). Imms (2018) suggests that educators who embrace innovative learning spaces as they are likely to improve the learning outcomes of our students and enhance their well-being. However, other research notes that noise levels in open plan classrooms could impact on learning, and that appropriate steps should be taken to accommodate students who are impacted (Shield et al., 2010). Students with a disability are likely to experience some challenges in an open plan classroom, unless appropriate measures are put into place to accommodate their learning profiles.

Respondents in urban and suburban schools held better perceptions of open plan learning with regard to administrative responsibilities within this setting. Administrative duties in larger schools within cities and suburban areas are often supported by administrative staff and support personnel, who may be reducing the load within the open plan classroom. Regional and rural schools, on account of small staff numbers, may not be able to enjoy access to administrative support. Contemporary thought in this regard reveals that the layout and plan in a classroom reveals the teacher's educational philosophy (Earp, 2017). Since there is no ideal classroom, teachers are likely to manage the open plan setting in line with their underlying beliefs about how students learn (Earp, 2017).

As a pilot study, the current project has been valuable in shedding light on the implementation of open plan settings in contemporary education. However, caution should be exercised in extrapolating or generalising these results to wider contexts. Further validation of the TPOPLS is required in the future, drawing on a larger study sample.

Implications and conclusion

In illuminating the factors which shape and influence teachers' perceptions of open plan learning, the following factors bear reference and may have implications for the maintenance and development open plan classrooms in contemporary primary and secondary schools.

1. Open plan learning appears to be better received in larger schools - where it is likely that there are better resources with regard to equipment, buildings and staff. More personnel are likely to share the workload, and would be better positioned to assist students with meeting their learning outcomes.
2. Teachers who have had previous success with open plan teaching view the construct more positively. This links primarily to self-efficacy beliefs. Schools would therefore do well to support staff with improving their skill and knowledge in this context, through targeted professional learning programs, to build confidence and enthusiasm.
3. Teachers generally perceived that open plan learning offered opportunities to meet students' social outcomes, however noise levels within open plan classrooms should be monitored especially with regard to its impact on social interaction.
4. Teachers perceived especially in larger schools that there was greater collegiality among staff, as they supported students within this non-traditional setting. Creating networks of support through communities of practice may provide another form of collective ownership of the student experience, and result in better student outcomes in the open plan classroom.
5. Students with a disability should be a focal point so that their needs are appropriately met. This applies especially to those students who may experience challenges with hearing, attending and processing information in the open plan classroom. Appropriate support systems will ensure that students with additional learning needs such as those with a disability, are fittingly accommodated.

Open plan learning is becoming popular in schools around Australia and indeed around the globe. With appropriate supports and monitoring, teachers acknowledge that these settings could suitably meet the academic and social outcomes of most students.

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Appendix 1: TPOPLS

Teachers Perceptions toward Open Plan Learning Spaces

The TPOPLS measures the perceptions of school teachers toward the use of open plan learning spaces. Open plan learning spaces refer to the combined teaching of larger groups of students, often involving multiple teaching personnel. It is a departure from the single cell classroom, usually requiring larger physical spaces and flexible, open plan environments.

You are required to read the statement, and then indicate your response by ticking one of the boxes to indicate whether you “Disagree Strongly”, “Disagree”, are neutral on the issue, or “Agree” or “Strongly Agree”.

In the second section, please complete the brief survey on your profile as an educator.

ACADEMIC		Disagree strongly	Disagree	Neutral	Agree	Agree strongly
A1	I believe that open learning spaces allow my students to perform better academically.					
A2	Open plan learning contributes to increased student achievement.					
A3	Open plan teaching enables more efficient assessment strategies.					
A4	Differentiated instruction is easier to implement in an open plan classroom.					
A5	I am able to implement more teaching strategies within an open plan classroom.					
A6	Open plan learning allows me to use lesson times creatively and flexibly.					
A7	Students can concentrate on tasks better in an open plan classroom.					
A8	Students enjoy the atmosphere of the open plan classroom as it allows them to work collaboratively.					
A9	Students are able to give of their best in an open plan classroom.					
SOCIAL		Disagree strongly	Disagree	Neutral	Agree	Agree strongly
S10	Open plan classrooms enhance social interaction between and among students.					
S11	Open plan classrooms provide a richer, overall experience for students.					
S12	Open plan classrooms allow me to get to know my students better with regard to their strengths and challenges.					

S13	Students respond positively to the space and freedom of the open plan classroom.					
S14	Several classes sharing the same space assists the overall development of the student.					
S15	Open plan classrooms enhance group work activities and assist in the social development of my students.					
S16	Students are efficiently able to effectively distinguish between irrelevant noises and the speech of their teacher and peers.					
COLLABORATION		Disagree strongly	Disagree	Neutral	Agree	Agree strongly
S17	I feel equipped and able to teach within an open plan classroom.					
S18	Using open plan learning allows me to collaborate better with other teaching staff.					
S19	Teaching with other staff within open plan classrooms is a form of professional development.					
S20	Teaching within an open plan classroom develops my skill as a teacher.					
S21	Collaborating within an open plan classroom involves the sharing of individual teaching philosophies.					
S22	Collaborating with other staff in an open plan setting impacts positively on overall student learning.					
S23	Teaching with other staff in an open plan setting provides increased opportunities for self and group reflections.					
S24	Teaching in teams in an open plan setting allows me to utilise my strengths as a teacher.					
S25	I feel valued and supported by other teaching staff when I taught in an open plan setting.					
S26	I experience greater enjoyment and feel rewarded in my efforts when I teach in an open plan classroom.					
S27	I prefer the team-teaching approach of the open plan classroom rather than being on my own in a single classroom.					
S28	I enjoy collaborating with my colleagues in order to plan for our lessons in the open plan classroom.					

S29	I enjoy sharing responsibility and decision-making in the collaborative open plan classroom, compared to being solely responsible for a single class.					
STUDENTS WITH ADDITIONAL LEARNING NEEDS		Disagree strongly	Disagree	Neutral	Agree	Agree strongly
SA30	The needs of students with disabilities are efficiently accommodated within an open plan setting.					
SA31	Students with different learning profiles and backgrounds feel included and accepted in an open plan classroom.					
SA32	I am better able to include students requiring acceleration in an open plan classroom.					
SA33	Students with additional learning needs respond better to instructional strategies in the open plan classroom.					
SA34	Students with diverse learning profiles are comfortable and well catered for in an open plan classroom.					
SA35	Students with Attention Deficit Disorders cope well in an open plan setting.					
SA36	Students with hearing impairments cope well in an open plan setting.					
SA37	The open plan classroom assist the language development of students from language backgrounds other than English.					
ADMINISTRATION		Disagree strongly	Disagree	Neutral	Agree	Agree strongly
AD38	Open plan classrooms require greater organisation and structuring of the timetable.					
AD39	Open plan teaching requires more time and greater effort on the part of teachers.					
AD40	The walls of our open plan classroom have been acoustically treated to accommodate the varying sound levels.					
AD41	Quiet rooms are available within the open plan setting for students who prefer to work alone.					
AD42	Open plan teaching and learning allows my school to efficiently use its physical and academic resources.					

Educator profiles

Instructions: Please respond to the following questions by ticking the box that corresponds with the most appropriate answer that applies to you.

I am a Pre-Service Teacher (you don't have to answer questions 5-11)
 Teacher in service

1. Your gender
 Female Male
2. Your age is
 Below 25 years 36 – 40 years
 25 – 30 years Above 40 years
 31 – 35 years
3. What is your highest level of qualification?
 Less than Bachelor's degree Educational Specialist degree
 Bachelor's degree Doctor of Education
 Master's degree Doctor of Philosophy
4. Which grade do you currently teach or plan to teach?
 Preschool Grade 7 – Grade 12 (secondary)
 Grade 1 – Grade 6 (primary)
5. How long have you been in the teaching profession?
 0-5 years 16-20 years
 6-10 years 21-25 years
 11-15 years More than 25 years
6. Where is your current school located?
 Urban/Metropolitan Rural
 Suburban
7. Tick the boxes that best describe your school.
 Private Select Entry School
 Independent Specialist School
 State/Government
8. Which of the following best describes the size of your school?
 1- 300 901 – 1200
 301 – 600 More than 1200
 601 - 900
9. Which of the following best describes the average class size at your school?
 Less than 10 students 31 – 40 students
 10 – 20 students More than 40 students
 21 – 30 students
10. What is the total number of students accommodated in your open plan classroom or an open plan classroom at your school?
 20-30 50-60
 30-40 More than 60 students
 40-50

