# Teacher adaptation to open learning spaces

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The "open classroom" emerged as a reaction against the industrial-era enclosed and authoritarian classroom. Although contemporary school architecture continues to incorporate and express ideas of openness, more research is needed about how teachers adapt to new and different built contexts. Our purpose is to identify teacher reaction to the affordances of open space learning environments. We outline a case study of teacher perceptions of working in new open plan school buildings. The case study demonstrates that affordances of open space classrooms include flexibility, visibility and scrutiny, and a de-emphasis of authority; teacher reactions included collective practice, team orientation, and increased interactions and a democratisation of authority. We argue that teacher reaction to the new open classroom features adaptability, intensification of day-to-day practice, and intra- and inter-personal knowledge and skills.

## Opening up the classroom

The insular classroom, based on a modularised cost-effective design, emerged during the 1800s, and was usually characterised by an authoritarian and transmissive mode of education (Rabinowitz, 1974). In his classic account of school buildings in the 1800s, Barnard (1848, p. 32) described a typical cramped school house: "School houses are not usually larger than twenty by twenty-four feet on the ground, and seven feet in height ... Not unfrequently sixty or seventy ... scholars occupy a room of this size."

Barnard's description of a constrained cellular space is consistent with Bataille's (in Hollier, 1990, p. 7) writing of the "architectural straitjacket" of buildings that imposed a mixed sense of servitude, awe, order, and constraint on people. We find similar sentiment in Hatton's (1999, pp. 66-67) comment that architecture primarily "advantages alienation" and "its conditions appear to be those of definition/distinction, confinement/separation".

Over previous decades educational theorists have provided numerous critiques, refinements and variations of the dominant industrial-era school model (see Gislason, 2007; Upitis, 2004). These attempts to understand physical space and how it dynamically represents, communicates and shapes learning behaviours and routines continue to influence school architecture and teaching practice (Melhuish, 2011). The term "open classroom" gained currency during the 1960s and into the 1970s, although experimentation with the use of open space can be traced to Dewey (United States of America) and Freinet (Europe) in the early 20th century (Sivell, 1994). The open classroom originated, and continues to evolve, as a multi-disciplinary reaction against perceptions of alienation, authoritarian control, restrictiveness, and stability of conventional classrooms and schools (Gulson & Symes, 2007). It generally referred to "a style of teaching involving flexibility of space, student choice of activity, richness of learning materials, integration of curriculum areas, and more individual or small-group rather than large-group instruction" (Horwitz, 1979, pp. 72-73).

Contemporary school architecture in the Western world frequently incorporates the open classroom concept (Melhuish, 2011; Nair & Fielding, 2005). New learning spaces are realised through the design of large open plan buildings and the use of virtual learning space, combining to formally afford more flexible educational practices (Leiringer & Cardellino, 2011). These educative spaces are non-hierarchical, multi-functional, integrate physical and virtual space, and authorise student control over approaches to learning (Melhuish, 2011). They are not definitively physically or conceptually separate from traditional school space, although there is sufficient dislocation for "questioning, and the possibility of a restructuring, of the hitherto stable boundaries between formal/informal, teacher/student, classroom/home" (Usher, 2002, p. 53).

Our purpose is to identify teacher reaction to the affordances of open space learning environments. We consider how modern architectural versions of the open classroom authorise different approaches to teaching. A case study is outlined of teachers reacting to working in a space largely undone from prior versions of traditional school buildings. A dynamic balance of convention and experimentation emerges as teachers adapt to the built affordances of their new school building. The study of how teachers respond to uncertainty and adapt to new learning spaces can inform ongoing research about effective pedagogy and school design (Clark, 1988; Boys, 2011).

## Affordances of new learning spaces

Building design can create an impression, or be symbolic, of the type of learning environment likely to be experienced (Gislason, 2007; Halpin, 2007; Tanner, 2000; Upitis, 2004). Gislason (2007, p. 6) noted that built spaces "offer a kind of signifying field for human activity, helping to give it an immediate and grounded direction". The intentions of an open plan building are not just an expression of an abstract idea, but seek to shape the practical actions and thinking of teachers and students (Halpin, 2007).

An open learning environment, physically expressed as a building larger than four conventional classrooms, may initially appear as an empty non-school space. On entry, teacher memories of practice and routine are likely to unravel, or at least be challenged. The openness of the space affords breaking from institutional traditions and flexible use of space and time.

For teachers and students this may afford a rethinking of teaching and learning. The resulting activity is a function of how the inhabitants of the space perceive the affordances and constraints of the learning environment. Affordances refer to those aspects of an environment that enable, contribute to, or constrain the kinds of interaction that subsequently occur (Greeno, 1994). The affordances of a context must be perceived by an individual who must also have the abilities to interact with these attributes. Although openness can disrupt teaching conventions, it is the social activity of the inhabitants that define the possibilities of a learning space (Lefebvre, 1991).

Previous studies have acknowledged the complex nature of learning environments (Leiringer & Cardellino, 2011. Gislason, 2010). This complexity creates difficulty in establishing causal links between physical environments and learning outcomes (Higgins, Hall, McCaughey, Wall, & Woolner, 2005). Similar to the "finished beginnings" characterising school designs in Barrett and Zhang (2009, p. iv), Leiringer and Cardellino (2011) noted that the school is not completed when the building is. Moreover, Leiringer and Cardellino (2011) acknowledged the fallacious claim that buildings will lead necessarily to improved educational outcomes. Essentially, the causal relationship can be characterised as contributory as distinct from necessary or sufficient. Furthermore, Higgins et al. (2005, p. 6) warn against "architectural determinism" when considering learning environments.

Particular difficulty is encountered when attempting to assess the impact of learning environments on student performance. A review of the available literature by Higgins et al. (2005) indicated a tendency to separate school environments into components. They concluded that there is "consistent evidence for the effect of basic physical variables (air quality, temperature, noise) on learning" (p. 7). Higgins et al. (2005) also noted that less significant effects are evident once basic standards have been achieved. Hattie's (2009) review of meta-studies indicated little to no impact from open plan environments. Hattie (2009, p. 89) concluded that factors such as open space and team teaching are not factors in "distinguishing effective from less effective open education programs". Hattie (2009) acknowledged an impact on non-achievement outcomes that did not correlate to academic achievement.

Welch (2000) and Jang (2006) examined teacher practice related to open plan learning environments. While each acknowledged limited capacity to generalise due to lack of a control group and the qualitative framework of the research, their findings are more promising than Hattie indicates (each demonstrated improved student outcomes as a result of varying team teaching initiatives). Furthermore, a meta-analysis by Martin and Pavan (1976) concluded that despite a lack of independent variables for assessing initiatives arising from open plan spaces, the overall impact of open plan environments are not to the detriment of student progression. The potential limitations of research in identifying student achievement improvements due to open plan environments are acknowledged. However, we acknowledge the "interactions of different elements are as important as the consideration of single elements" (Higgins et al., p. 22) and focus on observing emergent behaviour of teachers as they interact with the architecture of the open classroom.

## Teacher knowledge and open space

The take-up of the affordances of new learning spaces depends on teachers identifying and using this potential (Woolner, Hall, Higgins, McCaughey, & Wall, 2007). It is the purposeful linking of different theoretical, disciplinary and practical perspectives of openness which can result in a workable realisation of contextual affordances of flexible learning spaces (Blackmore, Bateman, Loughlin, O'Mara, & Aranda, 2011; Boys, 2011).

The teacher's thinking and practice, their engagement with the multiple perspectives about effective learning environments and related pedagogy, is a key influence in the effective use of learning space (Davis, Leach, & Clegg, 2011; Temple, 2007).

As noted by Desforges (1995) traditions and conventions exert a powerful influence on teacher activity. As a result, teachers may work in a new flexible space and sense that different teaching and learning is possible, yet continue to use pedagogical practices appropriate to more conventional cellular classrooms. Teachers may act in ways "contrary to those intended or expected by parties able to influence the design of school buildings" (Cooper, 1981, p. 133). Teachers tend to perceive and judge school structures in terms of the teaching functions they are expected to conduct within them (Wallace, 1980). It would be reasonable to expect a teacher of 25 students to seek out and claim some territory where the teaching would occur. This is an example of a potential disjuncture between the different perspectives of, for example, architectural abstraction and pragmatic day-to-day teaching practice (Boys, 2011). In a review of studies conducted during the 1970s of progressive classrooms, where buildings were designed to afford active and exploratory interactivity, Cooper (1981) identified that the majority of teacher practice remained traditional. As noted by Wallace (1980, p. 54), teaching in an enclosed classroom "may be seen as attractive to teachers, not only for the privacy and control over territory and environment it provides them with, but also because it ... assists the teacher with the maintenance of social order".

The reactivity of teachers to a different learning environment may include a spectrum of conflict, resistance, adaptation or change. As Woolner et al. (2012, p. 47) comment "it is possible … for physical innovation to be enacted but ignored and so fail to influence teaching and learning practices". Desforges (1995) commented that in order to change habitual practice, teachers have to consciously and willingly ask questions about their experience in new contexts.

Hargreaves (1997) and others characterise teachers as pragmatic, learning through personal experience about what works for them in their own classroom context. Yet Desforges (1995, p. 393) argues that "learning cannot be simply equated with experience, nor can it be expected to flow readily from it". Teacher learning is a function of rich interactions between context and a teacher's disposition to learn about their practice (Billett, 2001; Wilson & Demetriou, 2007). Context is the basis for teacher knowledge generated through lived experience and reflective questioning of that experience; resulting in a dynamic blend of formal and informal practical knowledge about teaching and learning (Askell-Williams & Lawson, 2005; Hoekstra & Korthagen, 2011). A teacher's practical knowledge emerges from and is specific to a certain context, used when making an argument for action, and a lens for interpreting experience.

Practical knowledge refers to the complex set of knowledge teachers draw upon and rebuild through their day-to-day classroom activity (Elbaz, 1981). This includes knowledge of their subject specialty, pedagogical approaches and preferences, personal and contextual knowledge about what works, practical knowledge of what and how to teach, and knowledge about how to interact with colleagues. According to Connelly and Clandinin

(1988, p. 25) "Personal practical knowledge is in the teacher's past experience, in the teacher's present mind and body, and in their future plans and actions." Practical knowledge is refined in response to different contexts for teaching and learning. This is a complex phenomenon, implying interplay between new ideas and multiple sets of existing teacher knowledge of subject matter, learning environment organisation, social context of the learning community, their students' interests and capacities, personal teaching preferences and strengths and pedagogical and cultural experience and familiarity (Elbaz 1981). The process of making sense of practice is immediate and "a relentless activity" (Ottesen, 2007, p. 620).

Cochran-Smith and Lytle (1999) observed that knowledge of practice is continually built and refined in the context of teacher action. A close examination of teachers' reasoning and argument for practice is one means of making sense of the "uncertainty, uniqueness, conflict and confusion" of new and emerging learning environments (Cherry, 2005, p. 311). For this reason our case study focuses on a description of the local context for action, and analysis of teacher reasoning about their practice in that context.

## Case study

The preceding section identifies the complex system of factors that needs to be considered in the interaction between the architectural intentions of the open classroom and the reaction of the teacher (Gislason, 2010; Woolner, McCarter, Wall, & Higgins, 2012). The case study approach as described by Yin (2009) used here is an attempt to show the complexity of these relational interactions. Case study research, particularly where there is a single case study, is often criticised for not addressing generalisability. A case is a methodological means of the fine grain examination of "a phenomenon specific to time and space [original emphasis]" (Gunckel, 2013, p. 5). Yet, generalisation from a case study can be based on a deductive analytical comparison between theoretical accounts of teaching and learning in open space and reported instances of these abstract ideas in practice (Ertmer & Newby, 1996; Gunckel, 2013). In other words, generalisation is concerned with the ongoing validation or explication, through divergent or analogous cases, of theoretical constructs related to open plan learning environments. As argued by Flyvbjerg (1996, p. 227) "That knowledge cannot be formally generalised does not mean that it cannot enter into the collective process of knowledge accumulation."

The case study is based on a school from the Bendigo Education Plan (BEP). The BEP states that "the regeneration of junior secondary schools in Bendigo (Victoria, Australia) is based on contemporary design principles that improve learning outcomes for students ... with design features to allow increased student access, use and ownership of the learning environment" (Department of Education and Early Childhood Development, 2006, p. 27). A key part of each BEP school design is the learning neighbourhood, a large open space accommodating 100-150 students, and staffed by a team of teachers. Each school has four buildings, or communities, each containing two or four neighbourhoods. The open nature of the neighbourhood design affords teachers working either one-on-one, with small or large groups. Teachers are part of the neighbourhood and can be sighted

and accessed at any time by students, and are expected to work in teams. Other design features of each building are integrated wireless and fixed computer spaces, studio classrooms for up to 25 students, tutorial rooms, and staff and meeting areas. Furniture that can be moved and used flexibly in a range of layouts is provided. The learning environments are characterised as flexible, meaning they can accommodate a range of teaching and learning approaches, including interdisciplinary inquiry-based, personalised, and community learning (Department of Education and Early Childhood Development, 2006).

The purpose of this case study is to identify teacher reaction and adaptation to the affordances of an open space environment. The analytical focus on the explication of context and subsequent teacher reaction are key arguments for the use of a case study (Stake, 1995; Yin, 2009). The case was purposefully selected as a unique and critical example of a newly constructed school, explicitly designed to signal and shape rejuvenation of teaching and learning within a low socio-economic area. Socio-economic profiles of the Bendigo schools revealed that all secondary schools have a "significant group of students in the lowest socio-economic group" (Department of Education and Early Childhood Development Loddon Mallee Region, 2005, p. 9).

Data were collected through interviews with four teachers covering a range of experience in the open plan settings and level of experience generally. The informants included a novice teacher (3 years), mid-career teacher (7 years), and two experienced teachers (28 and 30 years) with the second also in a leadership position (8 years). Discipline focus included English, Humanities, Physical Education and Science. Each staff member was asked to reflect on their teaching experience and make comparisons between traditionally arranged settings and the current open plan arrangements. Specific comparisons on the role of the teacher, the team and of leaders were solicited. In the case of the novice, whose entire career comprises open plan settings, responses were sought using perceived understandings of traditional settings.

The data analysis was based on a three-stage process. First, thematic categories were identified from the literature. Then, within each category a number of structural codes relating to teacher reasoning and the influence of the open spaces were identified (Saldana, 2009). These codes emerged during discussion by the authors, following an independent reading and initial coding of the interview transcripts. Finally, the agreed codes were used for a comprehensive analytical sweep of the data by the researchers. An overview of the initial thematic categories and final analytical codes is shown in Table 1.

## Findings

The data showed a perception of very limited downtime combined with a higher frequency of informal feedback between teachers. Teaching practice required weekly and sometimes daily negotiations of space, resources and authority. A key theme was the need for a greater level of adaptability in response to the affordance of flexibility. As teachers

Table 1: Data analysis categories and codes

|  | Initial thematic categories | Final analytical coding |
| --- | --- | --- |
| Teacher perceptions of the affordances of open space | Openness and flexibility (Boys, 2011; Gulson & Symes, 2007; Horwitz, 1979) | Flexibility of space<br><br>Increased visibility and scrutiny |
|  | Rethinking conventional organisation of space and time (Melhuish, 2011; Upitis, 2004; Usher, 2002) | De-emphasis of hierarchy |
| Teacher reaction to open space | The constraints of routine (Cooper, 1981; Desforges, 1995; Wallace, 1980; Woolner et al., 2012) | Collective practice<br><br>Team orientation<br><br>Interactions and authority |
|  | The influence of context (Billett, 2009; Hoekstra & Korthagen, 2011; Ottesen, 2007; Wilson & Demetriou, 2007) |  |

interact with the open plan spaces to implement team teaching and synchronous practice, adaptability is understood to be necessary and widely promulgated. Such tensility is also reported as necessary in non-pedagogical practice. The open plan settings have reoriented ideas of authority through increased interactions between teachers and teachers and students. Teachers perceived a de-emphasis of hierarchy on account of increased frequency of negotiation in critical moments and immediate resolution.

Two sets of themes were identified in the interview data: perceived affordances of the open spaces, and the reaction of teachers to these. Affordances were flexibility of space, increased visibility and scrutiny, and a de-emphasis of hierarchy. Teacher reaction themes were collective practice, team orientation, and interactions and authority.

## Affordances

*Flexibility of space*
The space was described by the teachers as inspiring a reconception of what is possible in terms of teaching and learning. The open space allows dynamic rethinking of how to use time and space for teaching of small and large groups. The impact of the open plan settings is described by Teacher D.

Before, it used to be one size fits all: we know what we're doing and the kids are just going to learn it. Now there's the constant questioning and how can we change what we're doing to meet the needs of the kids.

*Increased visibility and scrutiny*

The visibility of all facets of teacher practice provides the most obvious mechanism by which space impacts learning environments (Gislason, 2007). The significance of such a shift in perspective is seen when the professional orientation toward individual practice within teaching is understood. The increased visibility of teachers was achieved through open plan spaces adjoined by largely windowed staff rooms and shared facilities such as casual seating (breakout zones), kitchens and bathrooms. Levels of scrutiny were reported as having increased substantially in the open plan settings.

There are more informal interactions. You are accessible. You are in constant contact with kids and colleagues all day. There's a lot more informal talk than there was. There are no walls, just windows. It's a good thing. I reckon you need that. (Teacher B)

While visibility and scrutiny were factors influencing team orientation, they provide an obvious example of learning environments shaping theoretical perspectives.

There's much more pressure on us to perform. These learning spaces are much more than four walls. (Teacher A)

In one sense, the high level of scrutiny experienced by teachers is incongruous with team orientation. The new settings are asking for close, and often critical, examination of individual practice while demanding individuals relinquish their autonomy (to the team). To be judged against practice that is not wholly one's own is counter-intuitive.

A lot of older teachers feel like they're being judged. They're used to thirty years in a closed classroom… People can see your lesson. There is no privacy in your lesson. You feel like your teaching style is always being looked at by your peers and you're under pressure. (Teacher B)

*De-emphasis of hierarchy*

An affordance related to flexibility is a de-emphasis of hierarchy. The democratisation of the space occurs as a result of increased negotiations, higher frequency of communication between teachers, as well as teachers and students. The majority of these communications are informal. Instances of interactions between teachers include distribution of physical spaces (as described below), teaching resources and delivery methods. Such interactions are no longer limited to non-class time. The open plan settings are authorising a far less rigid understanding and use of space.

You can have the flexibility of just walking into their (other teachers') community and having a conversation with them… easier walking into an open

space rather than going into a traditional style classroom, it's just less invasive. (Teacher C)

You can have conversations with teachers if they're teaching across from you. It is easy. You can have a conversation, rather than saying 'have you got ten minutes?' (Teacher A)

Furthermore, teachers reported a greater level of support from their colleagues as a result of the fluidity of the space. Traditional settings required teachers to parcel time and formally arrange moments of professional development. The following example illustrates the potential of the open plan settings for teacher learning:

Mr P came to show me how to use the distillation machine. He just took the opportunity to show me. No planning. You couldn't really do that before. You would have to go out of your class. Knock on their door. Wait for an answer. Come in and ask… That sort of stuff happens more often. (Teacher B)

## Teacher reaction

*Collective practice*

The open plan setting has also seen the implementation of teacher teams. Team teaching is a particular focus in the new spaces. The school has joint English/Humanities classes, as well as Maths classes as part of the regular program; the teams consist of two classes and two teachers co-delivering. Teachers reported adaptability and flexibility as being critical to the success of measures such as team teaching. Teacher C described success as a "willingness to adapt and adjust". Likewise, Teacher A described successful team teaching as occurring when teachers are "happy to jump in wherever". The need for adaptability is evident in the challenges outlined by Teacher D: "One of the challenges is to be able to incorporate another person in to my teaching experience. When I walk in and I'm in charge of a group of students, it's not just me with those students: it is incorporating another person".

The opportunities afforded by the open plan setting are evident in team teaching. The impact on teachers is broadly accepted to be the demand of greater adaptability. The complexity of timetabling and staffing also created scenarios where classes of different disciplines are scheduled in the same open space. Such an arrangement placed greater emphasis on synchronicity of practice and further presses the need for flexibility. The school has developed a set of teacher protocols for the beginning and end of each teaching block. Taken together, the above factors indicate that a degree of adaptability in attitude to teaching is required. Furthermore, flexibility of practice is required for the new initiatives to be successful.

*Team orientation*

Team orientation is conceived of as a tendency to think and act as though a member of the group. It can also be considered in contrast to individualism (D. Hargreaves, 1980; Lortie, 1969). Team orientation is the result of the combination of high levels of

accountability as a result of visibility, joint planning, delivery and assessment; as well as the demands the space places on considering its use.

> We're more accountable too because we can all see each other. (Teacher C)

> Now there's the constant questioning and how can we change what we're doing to meet the needs of the kids. This has fostered the teamwork. It's not just about photocopy costs. Now it is about learning. That in itself fosters team work. If the focus is on the learning and on the kids then everyone is coming from the same viewpoint. …You've got this group of people together who have a common goal, a shared goal in terms of helping these kids learn. A shared goal makes a good team. (Teacher D)

Teachers in such spaces are recognising the theoretical perspective and altering practice to fit. The open plan settings necessitate that use of the space is deliberate. This, combined with joint delivery, establishes a strong compulsion to be team oriented.

> Teachers are more accountable. They must be more accountable. We're talking about the way we operate every day. You can't just sit in your comfort zone and think 'I won't plan this lesson'. (Teacher D)

The open plan settings have a significant impact on authority. This can be seen in reflections on both the practical management of students and an attitude toward authority more generally. Comparisons between the traditional spaces and the open plan reveal a benefit to teachers directly:

> You can kind of keep an eye on them a lot more spread out. When you were in a box as soon as they left that box you had no idea where they were. It allows us a lot more freedom. (Teacher C)

Further benefits to student management can be seen in reflections of a practical nature: "There is usually more than one set of eyes on them… it changes their behaviour in a positive way". (Teacher A)

The open plan space is described as having a "community feel" (Teacher C) where teachers are more familiar with students: "I get to know my kids so much more" (Teacher B). The benefits of this situation are described by Teacher A:

> I see the gains of an open learning space – I think a classroom is much more than four walls in terms of student learning and outcomes – …it enables teachers to have that informal contact with students even though you don't teach them or you don't teach them regularly. You are walking past them communicating. It builds relationships between teachers and students. I believe it changes the behaviour of students: they are becoming more responsible for their actions.

*Interactions and authority*

The realignment of authority is evident in the frequency of negotiations between teachers. Here there appears to be much that can be directly attributed to the open plan spaces. Teachers reported a higher level of ownership over the open space. It is described as "everybody's". This uncoupling from traditional conceptions of single, personal spaces is reinforced by the community's decision to operate without designated class spaces: teachers negotiate space use on a regular basis. The consequence of this is increased negotiations.

> We don't even have names on our rooms. We just negotiate. …We do it on an informal basis, it seems to work perfectly. The informal negotiations happen a fair bit. And you've got a small enough number of people that it works. (Teacher C)

The frequency of interactions and the de-emphasis of hierarchy create a situation where immediate resolution is necessary and preferable. In turn, the immediate resolution of critical moments amplifies the changing nature of hierarchy. The case study revealed that while an ideal situation would involve negotiation of a space or resource prior to implementation, it is often the case that the negotiations are conducted "live" or as the situation is unfolding. In the instance of an improvised English class combination the Science teacher responded by moving his class. There was no option but to resolve the situation as the lesson was commencing.

Moreover, it was reported that seeking an authority to assist in resolving such a negotiation would be a "waste of time" and the preferred mode would be to "Go straight to whoever's got the class and say what you need. You don't over complicate things that don't need to be". (Teacher B)

The volume of negotiations is established by the learning community's decision to leave teaching spaces unallocated. This places emphasis on such moments as beginnings and ends of lessons. Indeed, the difficulty associated with such moments has led to the community establishing an ideal "lesson" that frames up protocols for these junctures. Despite the presence of such protocols, the principle of flexibility has not been lost. The community leader reports a desire to continue with the negotiation of spaces as:

> It ensures that teachers do think about what they're doing before they go into the space. We think that's really important. It's easy to go to a space and then decide what you're going to do if you always go to that space. (Teacher D)

Further illustration of immediate resolution can be seen in the following example. The mid-career teacher reported the inappropriate behaviour of a nearby class. The elevated noise and disruption in the larger space occurred on account of the regular teacher leaving the space momentarily. Teacher B reported leaving his office to intervene: "I just took it on myself… I've got a bit of ownership over them so I make sure they don't muck up". The need for immediate resolution and the types of interactions taking place in the space is impacting the understanding and implementation of authority.

## Discussion

In contrast to the walled enclosures of conventional classrooms joined by a long corridor, the open spaces must initially appear as vast, empty and industrial. The physical absence of what was understood to be "school" means a sense of dislocation and anxiety may emerge as teachers attempt to enact the routine purposes of education. Teaching is a complex activity, and the complexity increases when the basis for making decisions about teaching and learning becomes uncertain.

What then was the teacher reaction to working in an open space learning environment? The case study demonstrated that the flexibility of open spaces afforded collective practice, visibility and scrutiny afforded a team orientation, and the de-emphasis of hierarchy afforded increased interactions and the democratisation of authority. This provides evidence that open space provides for the awareness, expression, and translation of a set of different perspectives that potentially can influence teaching practice (Boys, 2011; Davis et al., 2011). Based on the literature and the case study, we have identified three features of teacher reaction to open space: adaptability, intensification of day-to-day practice, and employment of intra- and inter-personal knowledge. In essence, the implication is that teacher adaptability is a key feature of successful engagement with the affordances of open plan settings. This perspective dominated responses to questions asking for identification of desirable traits and practice. In settings where the level of scrutiny is high, the volume of interactions are abundant, the negotiation of authority is constant, and the levels of autonomy are variable, teachers understand the influence to be such that adaptability is not just preferred but necessary. Yet we do not suggest this as a linear process. Adaptability emerges from the dynamic process of questioning and making sense of contextual practice (Connelly & Clandinin, 1988; Ottesen, 2007).

At the heart of the teacher reactions identified in the case study sit inter- and intra-personal skills. This is consistent with the frame of reference for teacher excellence proposed by Collinson (1999). Collinson draws on a triad of knowledge to define teacher excellence that rejects the singular focus on technical proficiency (subject-matter, curriculum and pedagogy). Collinson includes interpersonal knowledge and intrapersonal knowledge as foundations for teacher excellence. This is instructive to this paper as it is borne of modern settings with high levels of collaboration, and has implications for individual and collegial teaching practical knowledge. In the area of team work, for example, individuals must have team teaching skills, and the group of teachers acting in a team require an orientation to consciously and willingly ask questions and learn from their experience (Desforges, 1995; Wilson & Demetriou, 2007).

Taking advantage of the possibilities of flexible space may mean increased interactions as evident in team teaching. These practice changes may induce a feeling of a lack of privacy and a sense of exposure, disruptive noise, over-stimulation, impacting on task performance and individual stress (Davis et al., 2011). Adding to this is the variance in individual reaction and response to being in open plan settings. Rogers (2002, p. 48) notes that "teaming", characterised by "common purpose, common aims and complementary

interdependent skills", results in members understanding their "individual accountability is balanced with collective responsibility and interdependency". Achieving a counterintuitive balance in an environment where expectation and pressure is high requires the development of inter- and intra-personal skills.

We return to Usher's (2002, p. 53) comment that the loss of place leads to "questioning, and the possibility of restructuring." Practical teaching knowledge is not only informed by conventional experience and tradition, but by current contextual interactions, and is refined when planning for tomorrow (Clandinin, 1985). Teachers want to make sense of, and impose order upon, new learning environments and technological possibilities. They want to know what works, and how this translates to teaching practice.

## Concluding comment

This paper has argued that open plan learning environments provide affordances that impact the work of teachers. Openness, meaning flexible ideas about time and space for learning, is a concept that is changing perceptions of teaching and learning. Teachers are being called on to question classroom convention and routine, and to construct learning environments in response to new physical and virtual contexts. Within conventional settings, teachers demonstrating adaptability were preferred. Open plan learning environments alter the learning landscape and culture to the extent that adaptability is not simply preferred; it is necessary.

While our case study demonstrates the relationship between open space classrooms and teacher behaviour, we acknowledge that further cases are needed to elucidate the complex and dynamic interplay of space, time and teaching. Ongoing research in this area is needed as more open learning environments are constructed in reaction to the perceived issues of industrial-era school models that have come to dominate conceptions of learning environments.

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