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The Search for Pedagogical Dynamism – Design Patterns and the Unselfconscious Process

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ABSTRACT

An apparent paradigm shift has created increased impetus to offer higher education across multiple delivery platforms. Utilising technology can support design and delivery for enhanced learning, albeit with additional pressures on academic workloads, affecting the ability to deliver quality formal education that meets the needs of individuals and society. The issue is exacerbated when technology, not pedagogy, drives decision-making, and further intensified by the formalisation of education. Using Mishra and Koehler's TPACK framework, we argue that pedagogical dynamism is both necessary to maintain equilibrium of content-knowledge-pedagogy and a natural outcome. Further we suggest it is possible using Alexandrian design patterns and a return to the "unselfconscious process." We critique existing design pattern work in education, and contribute a meta-theoretical exploration of alexander's principles and patterns to designing good-fitting forms impacting education. A scenario of designing for "online," "on-campus" and "multi-mode" delivery of education is woven throughout to highlight implications for teaching practice.

Keywords

Pedagogical dynamism, Alexandrian design patterns, Educational technology, Educational design

Implications of technology-driven decision making in education design

Universities are embracing the growth of Internet access, implementing strategic plans to offer online learning (Kim & Bonk, 2006). In the U.S., nine percent of universities have MOOCs (Massive Open Online Courses) in various planning stages (Allen & Seaman, 2013). Technology has become a great ally in the task of designing education and enhancing learning. Students are now able to study via different, more flexible, delivery platform. This trend is symptomatic of using educational technology in a bold move to pursue opportunities of converging, seamless teaching and learning. However, underpinning this trend, it is apparent that technology is driving decision-making about content and pedagogy. There are challenges of navigating through various technologies, trying to force-fit activities into online settings, or compromising activities due to technological constraints. What is increasingly missing is a focus on traditional course development and educational quality (Schmieder, 2008), or what Alexander (1979) termed "aliveness," leading to "fragmented, alienating and/or dispiriting experiences" (Goodyear & Retalis, 2010).

Within a typical educational design context, the choice of what to teach is generally followed with technologies used and pedagogical goals (Mishra & Koehler, 2006). Take for example, the task of designing a program to be delivered both online and on-campus. University processes necessitate students choose a delivery mode at enrolment e.g., either "On-campus" or "Online." As technologies are rarely designed with teaching and learning in mind, when such an operational/technological approach drives pedagogical strategy, then pedagogy and learning activities also become fixed by the chosen delivery mode (Goodyear, 2005; Means et al., 2010). Complexity arises in the design phase, such as the need to create different course profiles and pedagogies to suit each delivery platform (Figure 1). Also, the way students learn and teachers teach is not necessarily considered, making it more difficult to prioritise and react to individual student needs and offer a genuinely enhanced learning experience equivalent across the delivery modes. If a new mode for learning and teaching is then incorporated, it confronts basic design issues. A new delivery mode reconstructs the dynamic equilibrium between content, pedagogy and technology (Mishra & Koehler, 2006), creating additional pressure for educators to understand (Herring et al., 2014). Moreover, if the organisation adjusts processes and practices to meet the needs of the technology and not pedagogy, then everyone ends up serving "the machine" (Pollock & Cornford, 2005). The ability to make available a single set of materials and activities for

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all students, across all delivery platforms, accessible according to their circumstances, becomes increasingly complex (Phillips & Lowe, 2003; Flynn, Concannon & Ní Bheacháin, 2005; Laurillard, 2009).

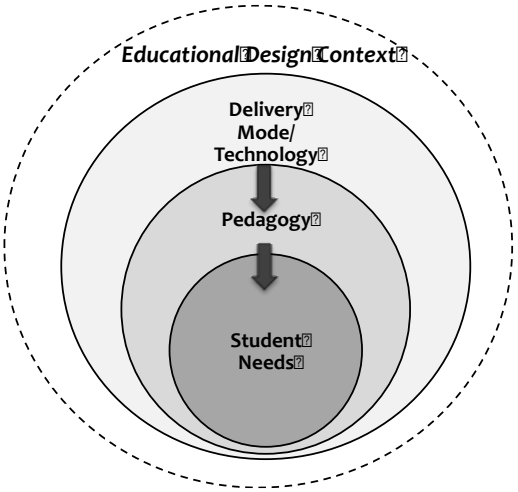

Figure 1. Current educational design context

The following section unpacks the issue of a technology-driven approach amidst compounding, complex variables, using Mishra & Koehler's (2006) TPACK framework, to illustrate the need to move towards a more dynamic pedagogical framework.

The challenge of maintaining dynamic equilibrium as complex variables compound

According to Mishra & Koehler's (2006) TPACK framework, the three main aspects of learning environments - content, pedagogy and technology - must exist in a state of continuous dynamic equilibrium or tension, as in Figure 2. A change in Content Knowledge (CK), Pedagogical Knowledge (PK), or Technological Knowledge (TK), must be "compensated" by a change in the other two aspects to rebalance the state of equilibrium of good teaching.

Using our previous example of designing a course to be delivered "Online," "On-campus" or "Multi-mode," good pedagogy requires the Learning Objectives (LO) of a course be equivalent irrespective of delivery mode (Biggs & Tang, 2007; Meyers & Nulty, 2009), making the function CK (Learning Objectives) a *fixed* variable in TPACK. Similar reasoning is applied to TK as a *fixed* variable, because "Online" and "On-campus" learning respectively create the functions TK (Online) and TK (On-campus). If "Multi-mode" is also considered, the function TK (Multi-mode) must also be created. Furthermore, because each of these functions represents a specific delivery platform, each TK becomes a *fixed* variable.

This leaves Pedagogical Knowledge (PK). Any change in TK will therefore have to be compensated by a change in PK, because CK (LOs) is fixed (Mishra & Koehler, 2006, p.1030). For example, if TK (Online) has to change to TK (On-campus), then PK (Online) has to change to PK (On-campus). If a course is offered in all three delivery modes i.e., TK (Online), TK (On-campus) and TK (Multi-mode), the designer's workload increases to design and maintain three or more PKs and their associated activities for each TK mode. For example, PK (Online) could include pre-recorded lectures available online, PK (On-campus) could be two-hour weekly lectures, and PK (Multi-mode) could offer a two-hour flipped classroom model. To complicate matters further, if a student's individual needs are to be considered to achieve an enhanced learning experience, this adds an additional dynamic quality within the already dynamic equilibrium of the TPACK framework. For example, one student may choose TK (On-campus) and a few weeks into semester, change to TK (Online) because of choice or circumstance, whereas another student may choose to maximise both TK (Online) and TK (On-campus) for the course duration. Therefore, there is a need for PK to change dynamically to provide personalisation within each TK combination, thereby demonstrating the necessity of pedagogically-driven design with dynamic adaptivity to maintain equilibrium.

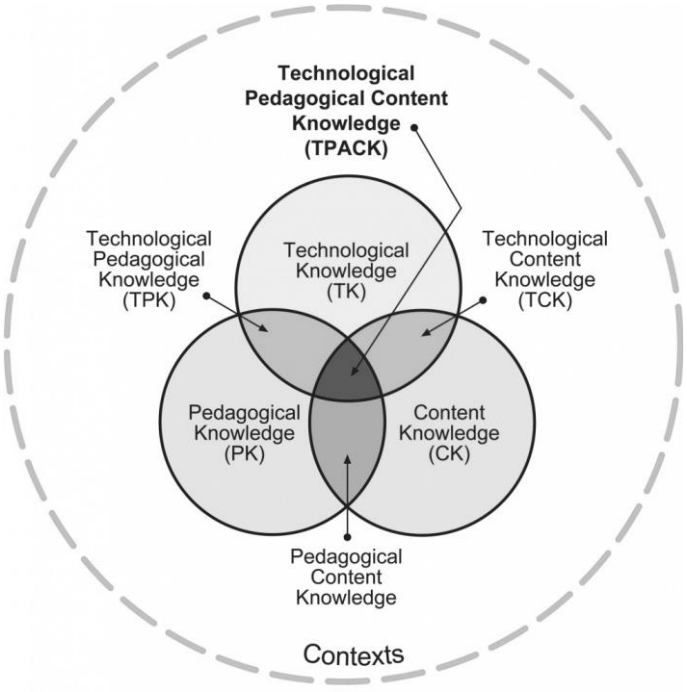

Figure 2. The TPACK framework (n.d.)

The TPACK framework suggests that technology is not separate from content or pedagogy Educators and designers are needed with content area specialisation including the ability to model TPACK (Herring et al., 2014). The TPACK framework does not include scope for dynamically changing variables driven by student needs and contexts (Koehler et al., 2014), though other related models identify these e.g., the ICT-Related PCK (Angeli & Valanides, 2005). The ability to offer an equivalent experience for students while maintaining continuous equilibrium is difficult if not impossible. The delivery mediums are variable, as are the audience, student's circumstances, pedagogical approaches, and technologies available (Herring et al., 2014; Means et al., 2010; Ury, 2004).

Seeking dynamic equilibrium by returning to a pedagogically-driven focus

Just like the flush toilet was once an innovative technology, in 100 years people will say the same about the Internet. Therefore, instead of pursuing educational design complexity by letting the technological environment, or TK, drive the design process, there is a need to return to a pedagogical focus (Mishra & Koehler, 2006; Goodyear, 2005; Garrison & Vaughan, 2008; Laurillard, 2009). Simultaneously, there is a push toward a learner-centric view, where educational technology is centered on quality of the learner's activity, and design is able to capture experiences and reuse pedagogic forms (Goodyear & Retalis, 2010; Laurillard, 2009).

Ensuring educational quality is especially relevant when considering the need for dynamic educational design across different disciplines e.g., teaching medical procedures versus management principles, to overseas versus domestically enrolled students. One approach to maintaining continuous equilibrium with each change of any TK or PK variable (CK is fixed), while keeping a focus on pedagogy during both design and delivery, is to align it with a continuous quality improvement cycle e.g., PDCA or Six Sigma (Sokovic, Pavletic & Pipan, 2010). However, this approach is still static because changes may not always be possible as they arise, especially when organisational processes prohibit change (Pollock & Cornford, 2005). In the design phase, the TPACK model is a good tool to use, as it removes the focus on technology and provides a platform of equilibrium between student needs, pedagogy and technology. During delivery however, it is students' individual needs that are most likely factor to unbalance the equilibrium. Therefore, in a learner-centric context, educators should be sensitive to student needs first, to which pedagogy responds, thereby influencing the technology to be used, as illustrated in Figure 3 as opposed to Figure 1.

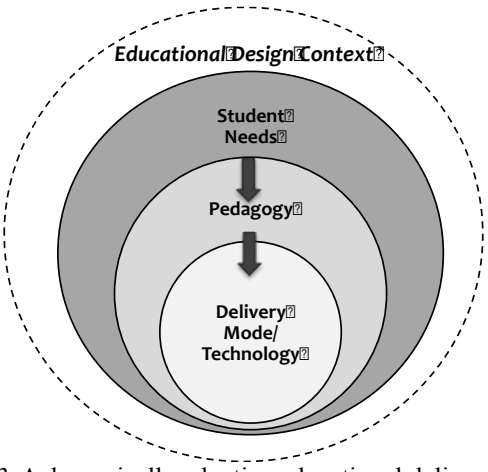

Figure 3. A dynamically adaptive educational delivery context

In this ideal, dynamically adaptive educational delivery context, the complexity of maintaining equilibrium is intensified because the student's needs drive changes in any of the forms of PK and TK. Mishra & Koehler (2006) and Goodyear's (2005) models do not explicitly address knowledge of the actual teaching and learning process (whether the knowledge is held by the teacher or the student), nor knowledge of practical variables that will ultimately influence changes in TK, PK or even CK. However, this knowledge is just as important because "it is not only the result that is important, but the process [of learning] as well" (Alexander, 1964, p.133), and is wonderfully illustrated in Perry's (1981) scheme of cognitive and ethical development. The need to create an environment that is conducive to pedagogical dynamism in order to maintain equilibrium prompts a search for other ways to effective design. A means to pedagogical dynamism can be found in design patterns and pattern languages.

An exploration of design patterns for education

The concept of design patterns originated in architecture in the 1970s, and has since been applied to disciplines involving complex tasks, such as software and aeronautical design. Educational design is also a complex task consisting of numerous layers (Meyers & Nulty, 2009; Schneckenberg, 2009; Laurillard, 2012; Mishra & Koehler, 2006; Palmer, 1998). Laurillard (2012) posits that teaching itself should be seen as a design science, inferring a solid foundation in using pattern languages in education. However, Alexander (1964) expressed Laurillard's views more than 30 years earlier and this is seen in his own patterns on learning, teaching and education (Alexander, Ishikawa & Silverstein, 1977).

Numerous strides have been made in the field of educational design patterns (e.g., Mor, Mellar, Warburton, & Winders, 2014). However, more work is needed before such educational pattern languages can be used with confidence for pedagogical dynamism. There are three key limitations. Firstly, there is a scarcity in pattern literature specifically targeting pedagogy (Mor, Mellar, Warburton, & Winters, 2014; Mor, Warburton & Winters, 2012; Lyardet, Rossi, & Schwabe, 1998), pedagogical dynamism, or even the principles of the [educational] design process. Secondly, like any language, a pattern has vocabulary, syntax and grammar. Existing education design patterns vary immensely in how they are constructed and worded, and when viewed collectively, provide a measure of confusion for novice readers e.g., Gibbon's (2010) design patterns are complex and difficult to understand without some knowledge of design layer theory. This defeats Alexander's objective that "anyone can design and build any structure…" (Alexander, Ishikawa, & Silverstein, 1977). Alexander (1964; 1979) went to great lengths to identify how a pattern should be constructed, identifying a clear method by which patterns were rigorously tested over time. He also emphasised that "just like a flower cannot be made, but only generated from the seed" (Alexander, 1979, p.157), patterns are merely a means of connecting people to a deeper life-generating quality that he called "aliveness," that can only be generated by the ordinary actions of people over time. There is little evidence to suggest that existing patterns in literature have been as rigorously tested and shown to link to that deeper life-generating quality Alexander alludes to. Thirdly, an in-depth study of Alexander's work reveals that "not only the form of the results but the form of the path which led to them" is crucial (Alexander, 1964, p. 133). In other words, the

foundations underlying any factor that leads to the complexity of educational design, including our earlier functions of PK, CK or TK, are the processes of learning and teaching.

We realised it would be hypocritical to offer our own version of a pattern language until the knowledge of what makes up the process itself can be comprehensively understood. Therefore we sought a formula for pedagogical dynamism not in recent research, but in Alexander's original and extensively tested work on pattern languages and design patterns.

Alexandrian design principles for pedagogical dynamism

According to Alexander, anyone can design and build any structure at any scale in a practical, safe and attractive way (Alexander, Ishikawa, & Silverstein, 1977), because there is a timeless way of building, if designers can rediscover the "unselfconscious process" (Alexander, 1964; 1979). Therein lies the fundamental underlying connection between patterns in a complex problem and the design of a form that could solve that problem. By stripping the complexity of the problem of design down to its basic elements, the *process* of design can be understood (Alexander, 1964). Even a designer who does not completely understand the problem at first can start the design process from any part of the problem which is understood, and from there work toward the unknown, producing a result that is usable.

Alexander (1979) identified a number of key underlying design principles i.e., understanding the principles of good form and good fit, in order to rediscover "aliveness" through the unselfconscious process, by being aware of the dangers of the self-conscious process. The following section explores each of these principles, progressing toward a deeper understanding of the basic tenets that underlie good design regardless of the level of complexity. From this, designers can then move onto design patterns as a template for delivering good-fitting forms that reflect a quality of "aliveness."

Understanding the principles of good form and good fit

An ensemble is made up of various *forms* and *contexts* with varying degrees of *fit*, where context defines the problem in which form becomes the solution (Alexander, 1964). The ultimate object of the process of design within an ensemble is good form (Alexander, 1964). Yet one cannot design good form without understanding what constitutes good fit. For example, using the previous scenario of designing for "Online," :On-Campus" and "Multi-mode" delivery, an educator's ensemble may include the following *forms*: a weekly two-hour lecture, with a one-hour practical directly after; in a classroom setting to students enrolled "On-campus"; with live streaming technology to provide synchronous engagement with "Online" students; whilst recording the entire session for later asynchronous access by "Online" or "On-Campus" students, as part of the "Multi-mode" requirements. Form may be variable during design though not always during delivery. The *context* could be numerous organizational demands, such as the use of specific technologies, or restrictions of time and space (as per Figure 1). However, it can also be argued that arising student needs also create context, if a dynamically adaptive approach is considered (as per Figure 3). In fact, any externally driven variation in CK, PK, or TK becomes a boundary-changer to context. Within this ensemble, certain learning/teaching/assessment activities have better *fit* better under certain circumstances, such as exam revision having better fit at the end of a teaching period, or certain technologies fitting better with different knowledge domains, or live streaming technology having better fit for online engagement as opposed to face-to-face interactions.

Good form is therefore a designer's ability to be alert for possible changes at every point in an ensemble, and simultaneously sensitive to the fit at boundary points within the ensemble, as boundaries of context can change (Alexander, 1964). Alexander argued that by shaping educational design within the demands that context places on it, designers can achieve "effortless contact or frictionless coexistence" (Alexander, 1964, p. 19), leading to a synthesised form dynamically as a solution to an existing complex problem i.e., a case for pedagogical dynamism. An example of this can occur in the above ensemble, where online students will log in to attend weekly live-streaming lectures, but not the practical sessions, thereby changing the boundary of context. However, because organizational processes do not allow form to be variable during delivery, no form changes can be made until the following semester, affecting the outcome of educational quality.

The Internet, the speed of change of technology, and the various student factors, constitute "impermanent materials and unsettled ways of life" which demand "constant reconstruction and repair" (Alexander, 1964, p. 50). Therefore, pedagogical dynamism is possible and necessary, not only as the outcome, but also as an element, of good form. However, there is no way of knowing, in education offered more flexibly which of the infinitely many relations between form and context to include or leave out, in order to match one good ensemble to another to create good form. This is because no matter how good the designer is, they are searching for a balance between two intangibles, one being a context that cannot be properly described, and the other being a form that has not yet been designed. However, because every designer is able to experience the sensation of "good fit" in an ensemble, good form can be achieved through good fit, which in turn can be identified through its negative, or "misfit" (Alexander, 1964).

Looking for misfits provides a way of identifying a solution within an ensemble where complexities exist. Educational design has long focused on listing requirements for good fit e.g., long lists of "principles of good practice," rather than searching for misfits. If fit is treated as the absence of misfits, then a list of misfits become the criteria for good fit. Using the TPACK model, by identifying all examples of changing student factors, during design or prior delivery, designers can identify misfits e.g., not changing the PK for different TKs, instead making available the same set materials and activities for all modes of delivery, accessible regardless of student circumstances (Phillips & Lowe, 2003). Misfits can also be identified as they arise by creating a multi-layered ensemble of feedback loops enabling the assessment of PK, CK or TK at the point of a misfit, thereby maintaining equilibrium of good form.

Good teaching however, is more than just technique and understanding good form and fit. It requires the ability to design and teach as an expression of one's own self (Palmer, 1998), or how Alexander (1964; 1979; 2004) describes living structures as "being" i.e., having spirit, in essence drawing linkages between environment, self and matter, and showed that good fitting form has a quality of "aliveness" or "wholeness," which can be achieved through the "unselfconscious process."

Rediscover "aliveness" through the unselfconscious process

Alexander categorised people into either unselfconscious or self-conscious cultures, based on methods of teaching and learning. An unselfconscious culture learns informally through continuous imitation and correction, with the unselfconscious process being self-adjusting and self-organising, hence providing active equilibrium with a system and consistently producing well-fitting forms (Alexander, 1964). In other words, in an unselfconscious process, the educational designer is also the one to deliver and be impacted by their own design as though they were the student. They are merely an agent, recognizing and responding continuously to misfits by making minor changes. Hattie (2009) alludes to this when he explains the need for teachers to become learners of their own teaching. Therefore, pedagogical dynamism is further possible when it is grounded in the conception that the designer, educator and student, together with teaching and learning processes, form an indispensable and mutually reciprocated relationship in a system that is unselfconscious. This approach creates a self-adjusting system that finds its own equilibrium.

Tacit knowledge is a good start, but as Bruner (1966) states, "instruction is a provisional state that has as its object to make the learner self-sufficient" (p. 53), and Perry (1981) further highlights the need for refined levels of skill and intuition to design teaching and curricula such that they invite, encourage, challenge and support students through the delicate yet inevitable nine stages of their ethical and cognitive development. Goodyear and Retalis (2010) reinforce this view, explaining that "good" educational technology design is characterised by a commitment to creating circumstances in which learning leads to experiences that are a source of pleasure, growth and transformation, as opposed to "fragmented, alienating and/or dispiriting experiences" (p. 18). Therefore, the unselfconscious process also recognises the need for a level of mastery [of a good teacher], because they intuitively know what works and what does not, and are able to react to individual student needs as they arise, changing pedagogy to suit. Technology is employed as an ally rather than being dictated by its constraints (Figure 3). However, time is required to develop this level of mastery (Ericsson, 1998). Furthermore, Alexander points out that "aliveness" cannot be attained by one person's mastery alone, only when all the people in a community build something; with some master/expert at the helm; over time; sharing a common language rather than by "design at the drawing board" (Alexander, 1964; 1979).

Therefore, patterns for good form are to be found in the unselfconscious process of form-producing and thus responsible for its success. However, if the unselfconscious process contains the quality of "aliveness," then

pedagogical dynamism will occur naturally due to the innate nature of the system to self-adjust and the inherent knowing of what needs to be done in the face of change. Therefore, pedagogical dynamism *is* the quality of aliveness, and if educational designers go back to the unselfconscious process, they might just unbundle some of this complexity and discover pedagogical dynamism. As Alexander admits though, society has lost the ability to recognise the unselfconscious process, due to having become self-conscious.

The dangers of a self-conscious process

Society's need for individual expression and recognition of one's individuality has brought about the self-conscious process, as each form created and its success is seen as individual achievement only (Alexander, 1964). What once took centuries of adaptation and development, a form clearly fitting its context, is beyond the average designer to achieve in a short time (Biggs & Tang, 2007; Fry, Ketteridge & Marshall, 2008). This is because the ever increasing number of factors that must fall simultaneously into place reduce the chances of success. In the unselfconscious process, one is directed without question to the right/wrong way. In the self-conscious process one is encouraged to question why, leading to the aggregation of failures/successes in some specific context. From this, good practice principles are generated, then theories and literary-based evidence, accruing ever more structure and abstraction. Formal teaching emerges, at which point the consequences of self-consciousness become visible on form. Goodyear and Retalis (2010) show that educational design is complex and challenging with often-unsatisfactory outcomes, highlighting that the self-conscious system's lack of success lies not in individual lack of capability, but in actions following one's awareness of one's weakness to overcome this incapability (Alexander, 1964). In essence, by formalising education, the initial problem of designing good form has been complicated.

This is seen in formalised education, where organizational constraints govern effectively-dynamic design e.g., pre-set curriculums with sub-constraints within those contexts, such as a two-hour lecture here, or a 20-minute module there; the many variables needed to satisfy compliance with governments and accrediting bodies; and where young people are still being educated in "batches" and graduate with formal qualifications without the necessary experiential and practical proficiencies to succeed in the workforce (Robinson, 2010).

As a result of society having become self-conscious, a method is needed to convert a complex problem into good form. To do this, a conceptual framework needs to be invented, such as design patterns, to make explicit maps of the problem's structure, which can lead designers to create form and thereby a solution (Alexander, 1964). Goodyear and Retalis (2010) also identify the shift to teaching-as-design, believing that educational design activities can be remarkably improved using a patterns-based approach. They too propose that good design "does not directly create activity, rather creating good learning tasks as blueprints for activity, leaving the detail of configuring the learning to the student" (Goodyear & Retalis, 2010, p.13). Good design, in particular, good design patterns, satisfy the self-conscious requirement for pedagogical dynamism.

Design patterns as a template for delivering good-fitting forms

A design pattern is a description of a recurring problem in an environment, that includes a description of the core of the solution to that problem, in such a way that the solution can be used many times over, without ever doing it the same way twice (Alexander, Ishikawa & Silverstein, 1977, p. x). Alexander showed that a good design pattern meets two empirical conditions: (1) *the problem is real*, meaning it can be expressed as a conflict among forces within the stated context, that cannot be resolved within that context; and (2) *the configuration solves the problem*, meaning that when the stated arrangement of parts is present in the stated context, the conflict can be resolved without side-effects (Alexander, 1979). Together, patterns form a language, with the power to generate an indefinite number of forms, with infinite variety in the details (Alexander, Ishikawa & Silverstein, 1977). Therefore, the question of the possibility of pedagogical dynamism can be restated into an Alexandrian problem: education becomes the stated *context*, including teaching and learning irrespective of the organisation. The *system of forces* can be those as outlined by Goodyear (2005) within educational design space, and in particular any changes in PK, CK or TK, such as between delivery mode, pedagogy, and individual student preferences. A likely *conflict* between these forces that recur is the prioritisation of delivery mode and resultant pedagogy over student needs.

Alexander developed a specific, detailed format for writing a pattern. Each pattern is consistently presented with other patterns, and also to "present the problem and solution of each such that it can be judged and modified without losing the essence central to it" (Alexander, C., Ishikawa, S. & Silverstein, M. 1977, p. xi). Alexander took a collaborative approach and many years designing and testing his patterns to "capture the invariant property common to all places which succeed in solving the problem" (p. xiv). Even then, Alexander admits to not having succeeded in this, and provides a rating for each pattern (using a series of asterisks) to denote the extent to which each pattern states a true invariant. Alexander's pattern format is being used to some extent in educational design (e.g., Goodyear, 2005), but not across the board. Existing educational patterns from various emerging researchers, when read together, do not form a consistent view of educational design easily followed by a novice. Educators and designers should be critical of using or building on existing modern educational design patterns, without carefully investigating whether they have been created through a combined unselfconscious and self-conscious process, collaboratively, over time and thoroughly tested. Being aware of our own tendency toward the self-conscious, we highlight again that it would be hypocritical to blueprint our own design patterns for pedagogical dynamism. However, a pattern language to support pedagogical dynamism can still be created, using Alexander's patterns. Extensive evidence of these patterns can be found in Alexander et al. (1973) and Alexander (1975) other publications. Figure 4 below lists nine patterns identified in Alexander's work that impact education (lower numbers indicate higher-order patterns, where lower-order patterns are embedded in higher-order patterns). Together, these nine patterns form a dynamic pattern language for educational design, with an infinite number of final solutions having the quality of "aliveness." If educators and designers follow the principles of the unselfconscious process, then any combination of the below patterns will, by design, produce a solution that is by nature pedagogically dynamic.

Pattern	Title	Description
18	**Network of learning ***	To decentralise the process of learning and connect it with many people and places all over
43	**University as a marketplace**	To allow self-paced learning for all ages using the real work of professionals as the basic nodes in the network
80	**Self governing workshops and offices ****	To support the nature of humans and their work in giving people understanding through face-to-face contact and autonomous enough to let them govern their own affairs.
83	**Master and apprentices ***	To use the real work of professionals and tradesmen as the basic nodes in a network of learning
84	**Teenage society**	To encourage teenagers to work out a self-organised learning society of their own
85	**Shopfront schools**	To create a large number of work-oriented small learning centers in those parts of town dominated by work and commercial activity
148	**Small Work Groups****	To create a workspace in such a way to make it possible for people to work in two's or three's, always in partial contact and partial privacy
151	**Small Meeting Rooms***	To create the ideally proportioned distribution, by both size and position
157	**Home Workshop**	To encourage the formation of seminars and workshops in peoples' homes

Figure 4. Alexander's patterns that impact education

Alexander provides guidelines for designing a form-fitting solution. Using a chosen sequence of patterns in line with the unselfconscious process, the design process is both iterative and evolutionary. The designer starts working with a higher-order pattern, firstly envisioning how it might look; then letting the form grow gradually, from amorphous to more defined with each iteration of design; treating each pattern as an entire and whole entity, before moving onto the next. As each pattern begins to take shape, adjustments need to be made to other patterns, readjusting the total gestalt of the design, taking into consideration in higher-order patterns how lower-order patterns might be impacted, and in lower-order patterns that the integrity of higher-order patterns is kept. As much as possible, the design process should not be on paper, but directly on the project or site, as close to the live outcome, and as close to the end-user as possible (Alexander, Ishikawa & Silverstein, 1977).

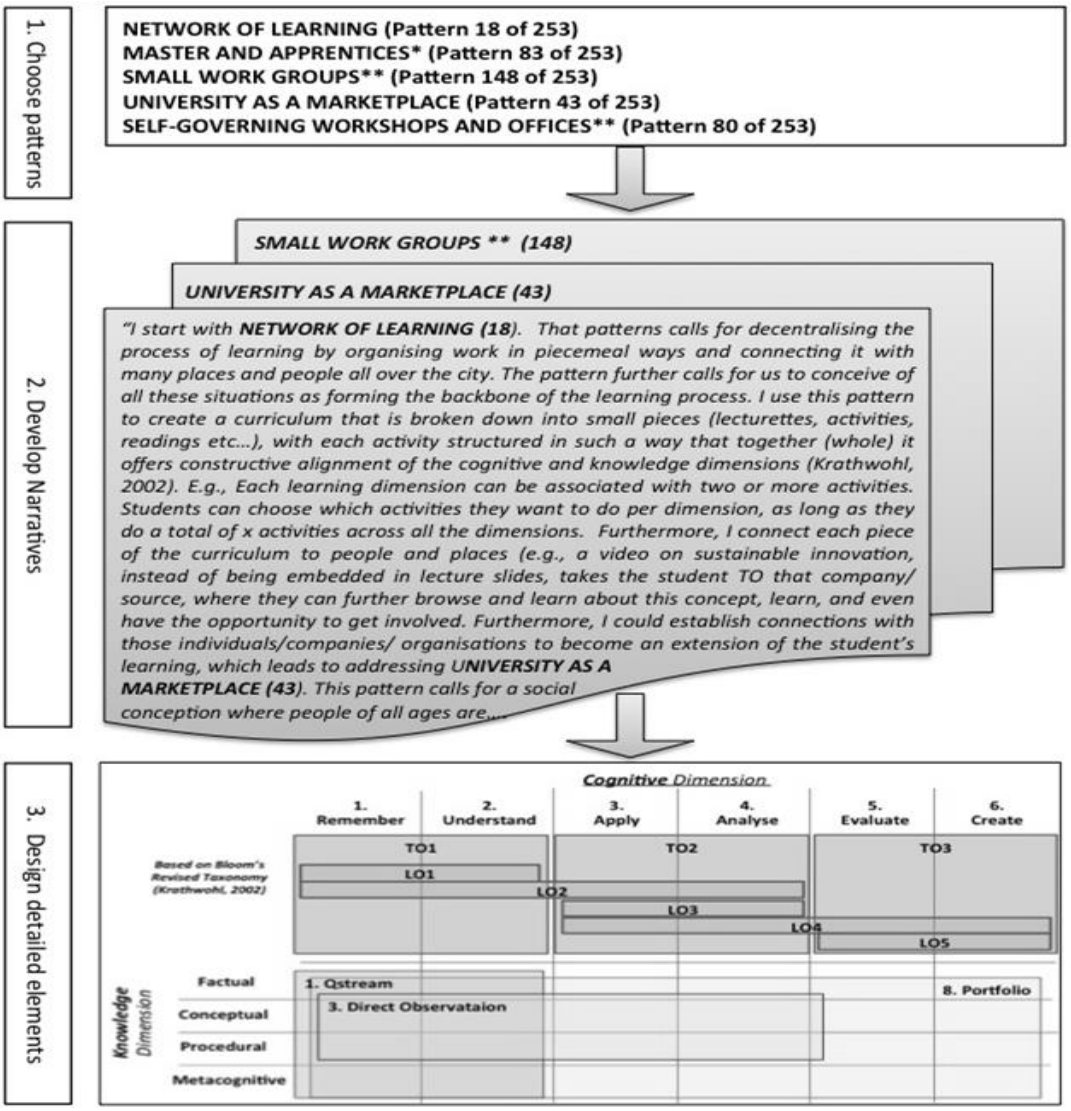

Figure 5. Sample solution for pedagogical dynamism using Alexandrian patterns

Figure 5 illustrates how we approached a solution for pedagogical dynamism for the previously mentioned scenario of designing an "Online," "On-campus" and "Mixed-mode" course, using Alexander's design guidelines. We firstly chose five of the above patterns. Secondly, we envisioned what the pattern would look like and developed narratives describing each pattern's key features. Thirdly, combining technological-content-pedagogical knowledge and mastery, over a series of collaborative peer-workshops, elements of good form began to emerge like a scaffolding (Meyers & Nulty, 2009) as we embedded into each pattern aspects of curriculum design such as learning objectives, teaching and learning activities, and assessment. The last diagram of Figure 5 shows a scaffolded visual summary of assessment activities aligning with learning objectives across the cognitive and knowledge dimensions of the learning process (Perry, 1981). Examples of boundaries of context that triggered continuous readjustments (during design and delivery) were where a learning activity touched the delivery mode, or where previous experiences of changing student needs touched any of the PK, CK or TK elements. Figure 5 outlines merely a portion of our design for a pedagogical dynamic course. Formative and summative feedback loops were established with students to test the effectiveness of the solution designed. The approach listed in this paper was implemented progressively over a number of teaching semesters.

However, as Alexander et al. (1977) states, "you cannot build a thing in isolation, but must also repair the world around it, and within it, so that the larger world becomes more coherent and more whole" (pp. xiii). The main limitations of such a pedagogically-driven approach were organisational processes, policies and structures preventing

higher-order pattern changes e.g., even though the Network of Learning pattern was envisioned to the full extent as per Alexander's pattern, the eventual design was scaled down and embedded in just one course.

Conclusion

When education design is driven by technology, the result will be ill-fitting forms, which cannot maintain dynamic equilibrium of a system, and will perpetuate the issues currently seen in higher education and educational quality. By using the TPACK model, we have shown that dynamic equilibrium can only be maintained by returning to design driven by pedagogy, with pedagogical dynamism as both a necessary component and natural outcome.

Good-fitting forms are needed in design, beginning with a deep understanding of the *process* of learning and teaching, the *process* of design, and the principles of good form and good fit. These are fundamental tenets that generate the quality of "aliveness," wherein patterns for good-fitting form occur naturally, because of the innate nature of the resultant system to self-adjust. An attuned designer will have the ability to be alert to, and dynamically respond to, possible changes (misfits) at every point in an ensemble. However, in the wake of compounding complex variables, the ability to design good-fitting forms is beyond the average designer partly because society has lost the ability to recognise the unselfconscious process, having unawares fallen victim to the self-conscious process. Therefore a method is needed to convert a complex problem, such as pedagogical dynamism, into good-fitting form.

So if progress is to be made towards education "aliveness," tacit knowledge is a good start, but fundamentally, there must first be a conscious shift in introspective awareness, where designers and educators relinquish their identities and desires for recognition that define their work and self-conscious nature, and choose to rediscover the timeless way of teaching and learning. This may require changes to the individual and/or educational environments, such as: becoming learners of their own teaching; more sensitivity to identifying misfits and boundary-changes to context; more flexibility in changing teaching practices as needed, even if they don't align with institutional demands; and more inclusivity of, and patience towards, students and their individual needs. Additionally, the aspect of mastery – a life of devotion to one's craft – cannot be ignored nor fast-tracked, thus fervency in lobbying for organisational support of the unselfconscious process is also constructive.

Furthermore, in a meta-theoretical exploration of design patterns and principles, this paper provides a synthesis of existing literature about using design patterns to achieve pedagogical dynamism, because the field of design patterns specific to education is relatively new and still largely untested. So before adopting existing educational design patterns, designers should carefully assess them according to Alexander's key guidelines, namely: the extent to which they have been created through a combined unselfconscious and self-conscious process; collaboratively; over time; sharing a common language rather than by "design at the drawing board"; written to a consistent structure and understandable to all; and thoroughly tested addressing Alexander's two empirical design conditions. Clear instructions are offered in Alexander, Ishikawa and Silverstein (1977). In the meantime, educators and designers can still progress towards pedagogical dynamism by using Alexander's original, well-tested patterns. We identify at least nine Alexandrian patterns directly impacting education, and provide a brief example of how this is possible with the scenario of designing a course for "Online," "On-campus" and "Multi-mode" delivery using Alexander's narrative approach."

A key contribution of this paper is to highlight the need to strip the complexity of the problem of educational design down to its basic elements, and understand the *process* of design. Then even a novice designer can start the design process and produce a result that is usable. This paper transfers Alexander's original design principles and patterns directly into the field of education, offering a synthesized, conceptual and authentic foundation for educational design. As there is a lack of literature on pedagogical dynamism, and what the "unselfconscious process," as envisioned by Alexander, could possibly look like in modern education, further developments include: revisiting the integrity of existing education patterns in accordance with Alexander's above-mentioned guidelines; increased collaboration or professional development workshops, to develop a shared common pattern language for education based on the above-listed Alexandrian patterns; and more literature of successful progress towards an unselfconscious process in education.

Any actions taken towards the unselfconscious process will achieve pedagogical dynamism as an inevitable by-product. Because educational design is not an isolated process, this will, in turn, create boundary-changes to a larger

context affecting farther-reaching issues, such as casualization of the academic workforce, increased academic loads, decreased focus on teaching as opposed to research, and academic disciplinary silos. The timeless way of teaching and learning goes beyond disciplinary boundaries, new technology, and even designing patterns and languages. They only serve as a reminder of what every teacher knows already when they give up their ideas and opinions, and do what emerges from themselves. Good-fitting forms, of which pedagogical dynamism is one, are not to be found in explicit rules, formalities, and institutionalization, but should, like life, unfold and evolve naturally, thereby continuously creating itself within a self-adjusting system. The process of teaching and learning can then become alive and joyful rather than complex and burdensome.

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