

## START IT RIGHT [S.I.R.] – A HETERARCHY STUDIO PEDAGOGICAL MODEL FOR GENERATION Z LEARNERS

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**Abstract:** Despite the collaborative nature of professional practices, design tutors have remained faithful to the instructional and siloed teaching methods of the Master and Apprentice (M&A) model. In our 21st century’s context of accelerated change, the shortcomings of this dogmatic studio pedagogy in inculcating soft skills, academic buoyancies, and self-directed learning (SDL) mindsets—all quintessential for Generation Z’s survival in the imminent knowledge economy—are worrying. The development of effective design studio pedagogical models to address these challenges is a novel research area, with little currently presented in the literature. This study aims to conceive and articulate an alternative, “Start-it-Right (S.I.R.)” pedagogical structure relevant to first-year, Generation Z learners in design education. Three distinct S.I.R. studio mechanisms emerge from the mapping of secondary data on Generation Z’s learning dispositions to instill desired SDL behaviours, interweaving curricular design as to inform a studio pedagogical framework within a tutor-choreographed, heterarchical, team learning culture. The S.I.R. model is driven by structured design briefs along with cross-pollinating, peer-to-peer design critiques. The tutor’s inducement of constructive criticism among students progressively decreases until learners are constructing their own critiques to spur their self-directed learning journeys. By cultivating various non-cognitive skills in the S.I.R studio, students are better prepared to enter the highly precarious, innovation-driven economy. This chapter presents a contextualized pedagogical structure in which numerous non-hierarchical design critiquing techniques and student engagement strategies can be incorporated. *Keywords: formative design studio pedagogy; soft skills; self-directed learning; heterarchical pedagogy; cross-pollination*

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## THE EMERGING KNOWLEDGE ECONOMIES AND THE CONSERVATIVE DESIGN STUDIO

Education reformer John Dewey (1923) had famously proclaimed that “If we teach today’s students as we taught yesterday’s, we rob them of tomorrow.” In recent years design educators have had the unenviable task of developing curricula for increasingly unstable employments and evolving job profiles (Davidson, 2012; Dell Technologies & Institute for the Future, 2017; Koh & Lee, 2008; Organisation for Economic Co-operation and Development, 2018). With our reliance on the trading of physical commodities and natural resources in driving our market (Powell & Snellman, 2004) no longer viable, we need to focus on an innovation-driven economy (Cowell, 2006; Popkova, 2018; Powell & Snellman, 2004) contingent on knowledge production, technological output, and information dissemination.

As “Design” is projected to extend its influences into the future, design enterprises must remain agile at reinventing their practices (Jamieson, 2011), and adept at devising design-led creative thinking methodologies (Hertenstein et al., 2013; Roy & Riedel, 1997) to address looming social and economic challenges (Design Education Review Committee, 2019). “Design” outcomes are now being exploited and interwoven in non-allied fields (D’Ippolito, 2014) as design-led transdisciplinary practices. These practices will be increasingly sought after by an extended range of industries and public service agencies aiming to create strategic competitive advantages by transforming systems, experiences, and organizations (D’Ippolito, 2014; Design Education Review Committee, 2019). For design practices operating in an expanded field, an alternative non-hierarchical design process in which designers co-design with non-designers will become more and more prevalent.

Designers pride themselves on being agents of change, so it is puzzling that design educators have been faithful to the one-on-one, Master & Apprentice (M&A) desk critique pedagogy inherited from the 20th-century industrial revolution. Daily formative design studio critiques are often regarded as the pulse of design education, but the concept of a “studio” has remained enigmatic (Ostwald & Williams, 2008). There is no single definition of a design studio (Schön, 1987), despite its status and the resources that support it (Ostwald & Williams, 2008). As the process of designing will be increasingly democratized in the future, the appropriateness of the curiously unchallenged one-on-one M&A critiquing model must be questioned.

Based on relationships drawn between relevant secondary data, the “Start-it-Right (S.I.R.)” heterarchical studio pedagogy results in a model pertinent to first-year Generation Z learners. As illustrated in Figure 1, the fundamental concepts of S.I.R.’s pedagogical structures are established with considerations of Generation Z learners’ learning dispositions and intertwined with pedagogical strategies that induce Self-Directed Learning (SDL). The resultant non-hierarchical S.I.R. studio interweaves facets of the design curriculum (content and structuring of the project brief with cognitive and non-cognitive learning outcomes) with pedagogy (art and science of facilitation during formative design critiques). This research creates an increasingly pertinent framework, and a context in which different design studio critiques and student engagement techniques can be integrated.

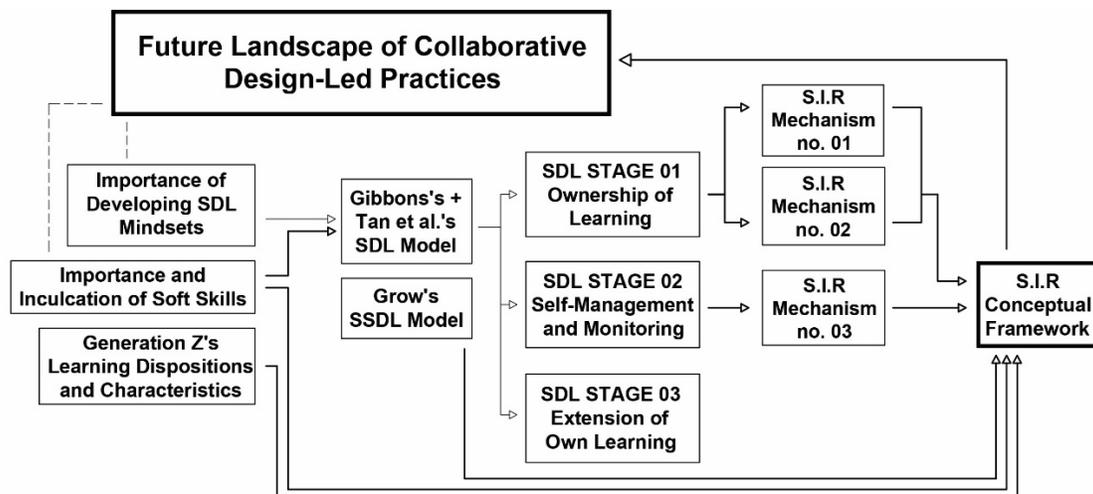


Figure 1. S.I.R. model's relational mapping diagram.

## THE RELEVANCIES OF THE MASTER AND APPRENTICE MODEL

With a highly precarious economy emerging amidst the Industrial Revolution 4.0, design educators must question the relevance of the pervasive one-on-one M&A studio pedagogical model (Liow, 2019). M&A pedagogy inhibits the development of design thinking skills for novice designers. Dogmatic and hierarchical practices prevail in design studios where the Master Tutor imposes preferred design methodologies and value systems onto learners. The tutor's ritualistic method in leading studios hinders learners from building confidence and restricts the discovery of new insights by both learners and tutors. To avoid jeopardizing their grades, first-year design students from a prior STEM-based education might feel obliged to closely mimic and accept the tutor's suggestions. Green and Bonollo (2003) concluded that students engaging in one-on-one desk critiques tend to heavily depend on tutors for the generation and resolution of their designs. The ideal discursive learning environment, in which tutors actively facilitate polemical discussions in a heterarchical approach, is seldom evident in our contemporary studios (Liow, 2016). Even when faced with an international trend of funding cuts that decrease one-to-one student-tutor contact time, the paradigm of the studio master having a dominant hand in guiding students is rarely challenged (Tucker & Reynolds, 2006; Wallis & Williams, 2012).

## SELF-DIRECTED LEARNING (SDL) AS AN IMPORTANT DISPOSITION

Lifelong learning is projected to take on a significant role in the future. The World Economic Forum (2018) forecasted that, by 2022, at least 54% of the workforce would require substantial re-training and upskilling to remain relevant. Introducing SDL mindsets into both curricula and pedagogy as a 21st-century skill (Lemke, 2002; Vockley & Lang, 2008; Tan et al., 2011) is thus essential in charting our academic trajectories. Generation Z's education is not merely about providing essential tools/software (Sladek & Grabinger, 2014), but about instilling learners with necessary skills and mindsets through an SDL-focused educational structure for an ever-changing and globalized knowledge economy.

Gibbons, a prolific proponent of SDL, defined it as "any increase in knowledge, skill, accomplishment, or personal progression that an individual selects and brings about by his or her efforts using any technique in any circumstances at any time" (Gibbons, 2003). SDL emerged as a formal field of study in the late 1960s, using a focus on instructional design to help educators understand how adults learn (Tough, 1967). In the 1990s, Grow (1991) shifted SDL's research trajectory to focus on the learning process, namely learner characteristics, learning context, and the nature of learning itself. Grow's Staged Self-Directed Learning (SSDL) model prioritized learners' needs, stressing the importance of appropriate scaffold learning activities and tutors' engagement in constructing learners' readiness for SDL (Grow, 1991; Tan et al., 2011). Grow's SSDL model promoted gradually releasing tutors' responsibilities for knowledge acquisition to the students, transiting from Teacher-Directed Learning (TDL) to an SDL model. During this transition, the tutor's role changes from "prescriptive" and authoritative teacher to Guide, neutralized Facilitator, and finally to Delegator. The viability of SSDL, however, is highly dependent on the tutor's personal teaching practices and their beliefs about the orthodox hierarchical relationships between teacher and learner.

## Potential of SDL in the Design Studio

While Tan et al. (2011) argued that SDL mindsets are innate in all learners, Gibbons (2003) and Grow (1991) rationalized that SDL is a gradual inductive process. Gibbons' (2003) SDL model is conceptualized as a transitional advancement of three stages, with students first adopting "ownership of their learning," then "self-managing and monitoring ... their progress" and finally moving to an "extension of their own learning." Tan et al. (2011) further expanded Gibbons' three stages with possible behavioural indicators (illustrated in Figure 2).

Traditional education models have predominately operated via a TDL model in which the teacher continually directs learning (Gibbons, 2003), and the M&A design studio pedagogy is no exception. The impact of the dogmatic M&A TDL pedagogy on students' academic growth is likened to a washing machine repeatedly on the rinse cycle, depriving students of opportunities to build resilience in their iterative design process by shielding them from frequent setbacks in their explorations. Rather than designing for and facilitating with desired SDL behaviours, design tutors rarely plan the gradual transition of novice learners from a TDL pedagogy to SDL.

The S.I.R. studio takes cues from Tan et al.'s SDL behaviours indicators (from the "Ownership of Learning" and "Self-Management and Monitoring" stages), augmenting them with Grow's SSDL model to create explicit tasks and instructions in the design brief. The conversational and explorative nature of the "problem-based learning" design studio is well-positioned to develop student autonomy, leading to the personal pursuit of meaning through design discussions and critiques.

## BEYOND HARD SKILLS — THE EXPANDED ROLE OF ACADEMIA

With the passing of each technological revolution, the world has witnessed the disappearance of outmoded occupational roles and the vibrant growth of new ones. The impending Industrial Revolution 4.0 is no exception. The outlook for designers, however, remains optimistic. Jobs involving coordination, development, management, and advisory positions are considered stable. The designers' role, often requiring human-centred approaches to solve complex problems, is projected to experience less dependence on artificial intelligence than other fields (World Economic Forum, 2018). With the rise of collaborative transdisciplinary practices, the development of transferable soft skills must help define educational trajectories.

Narratives of remaining competent in traditional job disciplines late into our lives are no longer tenable. Academia's roles and responsibilities must extend beyond producing technically skilled graduates to helping those graduates build a spectrum of non-cognitive skills. The World Economic Forum (2018) has stressed that soft skills such as negotiating, reasoning, complex problem-solving, ideation, emotional intelligence, and resilience are essential attributes for the Industrial Revolution 4.0. While the conventional format of lectures and seminars makes it challenging to effectively teach these skills, the discursive learning environment of "problem-based learning" design studio pedagogy provides ideal conditions for students to develop these skills by practising them. For these reasons, institutions' role must expand to include instilling competencies of soft skills and notions of self-directed continuing education to future-proof the careers of Generation Z learners.

## GENERATION Z'S LEARNING DISPOSITIONS AND DESIGN EDUCATION

Generation Z refers to those born between 1996 and 2009 (Sladek & Grabinger, 2014) or 2012 (Schwieger & Ladwig, 2018). Very few investigations have been conducted on adolescent Generation Z students (Rue, 2018), especially in terms of design education. Nevertheless, secondary data were evaluated to inform potential trajectories in guiding the reconstruction of the design studio's pedagogy and curricula. By tailoring instruction to the learning dispositions of Generation Z learners, educators can help prepare them for an increasingly precarious VUCA (Volatility, Uncertainty, Complexity, and Ambiguity) future.

### Collaboration as a Soft Skill

The relentless pursuit of academic success among Generation Z learners' has resulted in them being both goal-orientated (Villa & Dorsey, 2017) and highly collaborative (Schwieger & Ladwig, 2018; Sladek & Grabinger, 2014; Rue, 2018). Duse and Duse (2016), Roseberry-McKibbin (2017) and Sladek and Grabinger (2014) have revealed that, despite having spent most of their lives cooperating in teams, Generation Zs are also excessively competitive

and individualistic. Their willingness to collaborate in teams does not equate to their inclination to participate. This stark contrast is intriguing. Roseberry-McKibbin (2017) substantiates this claim by describing Generation Z's strong preference to work alone, even while being cooperative in team/group assignments.

In architecture, Bryant et al. (2018) have argued that traditions of self-referential M&A pedagogies and siloed academic units/disciplinary practices must be examined in today's uncertain climate. Collaboration is an essential attribute supporting both existing and emerging models of design-led enterprises (Bryant et al., 2018; Pressman, 2014; Venturini, 2019). While design educators have always stressed the importance of collaboration for both design curricula and pedagogies (McPeck, 2009; McPeck & Morthland, 2010; Tucker & Rollo, 2003; Tucker, 2017; Wilson & Zamberlan, 2017), it is an uphill challenge to impart these traits in traditional studios (Smith & Hu, 2013). Educators' attempts to prepare students to collaborate are solely through sporadic group and team assignments. Such short-spanned cooperative projects, frequently in the form of site analysis and case studies in architecture studios, often result in learners assembling their respective parts to form a coherent singular submission, and group work ceases when students embark on their individual projects (Liow, 2019).

### Criticality + Agencies = Pursuit of Meanings

The hyper-connected Generation Zs (Sladek & Grabinger, 2014) identify themselves as boundary-less global citizens who are ardent about current pressing matters. In contrast to the "passive" millennials who "sat out" the 2016 U.S. presidential election, Generation Zs are civically engaged and more determined to seek change (Rue, 2018). With their lives centred on purposeful aims, Generation Zs are purported to develop unwavering commitments in achieving their goals (Sladek & Grabinger, 2014). Matching their desire to effect change with the empowerment of "potential agencies" hypothetically spurs Generation Zs to establish the pursuit of meaning. Merriam Webster's online dictionary (2020) defines "agency" as the "capacity, condition, state of acting, or of exerting power." A personal sense of agency emerges from processes of steadfast reflection, compromise, and negotiation (Tomanović, 2012). Educators can help tease out learners' intrinsic motivation to structure their quest for meanings by bridging the design disciplines' critical perspectives with relevant contemporary challenges. It is therefore vital to create curricula and pedagogies that are stepping stones in empowering students' journeys in shaping their purposes in life (Duse & Duse, 2016; Gibbons, 2003).

### Craves for Structured Learning

Generation Z learners prefer learning journeys that are highly structured and coordinated (Duse & Duse, 2016; Roseberry-McKibbin, 2017; Sladek & Grabinger, 2014). This has been attributed to their learning in a very systematic manner and being regularly aided/monitored during their childhoods (Singh, 2014) by "helicopter parenting" (Sladek & Grabinger, 2014). Lukianoff and Haidt (2019) define helicopter parents being overprotective in their children's upbringing. Lukianoff and Haidt (2019) observed declining resilience among college students due to their smooth-sailing childhood experiences. Lacking stressors when young, learners' fears were amplified, and confidence eroded when making decisions during their adolescence. Amidst our world's accelerated change and uncertainties, Generation Z learners' lack of mental resilience is detrimental to their academic growth and development of agencies in their professional endeavours.

Risk-taking, an integral attribute of the repetitious design process, will inevitably be affected by this lack of mental resilience. In design studios, the gravity of its impact can be mediated with strategic pedagogical interventions. While Generation Z learners in an M&A studio may find comfort with the tendencies of Studio Masters reducing the uncertainties of the design process through explicit instruction (Green & Bonollo, 2003), this TDL approach is antithetical to developing novice designers' confidence in exploring ideas within the iterative design process. Instead, it will deepen their dependencies, especially when their grades might be at stake. Generation Z's appetite

for structured learning and the immediacy of “answers” from their tutors at their disposal appear to fuel their impatience with the design process.

### Limited Patience for the Iterative Design Process

Being “digital natives” (Singh, 2014), Generation Zs are accustomed to seeking answers on the web. Their reluctance to consider their sources’ credibility (Rue, 2018; Sladek & Grabinger, 2014) and tendency to subscribe to logical fallacies with an “authoritative appeal” are detrimental to the development of critical thinking skills. In terms of the design process, Generation Zs’ impatience in the pursuit of a final outcome, fuelled by childhoods filled with on-demand entertainment and instantaneous Google results, has led to unfavourable fixated mindsets in the design process.

Novice design students tend to “research” through popular design webpages, seeking quick solutions. Notions of celebrating the aesthetics of renowned contemporary projects, where they are merely the results of their formal expressions being regurgitated from earlier designs (passed off as signature styles), are troubling observations in the author’s first-year architecture studios. New aesthetical forms do not necessarily equate to the emergence of new ideas. Beginning learners can be led astray by the misconception that “design” is merely an insular activity of developing formal aesthetics. Students who lack the patience to build their analytical skills are at a disadvantage in understanding how designs are contextually derived.

The phenomenon in which students adapt aesthetical qualities of their precedent/case studies as an argument for justifying their design decisions is nothing new. Goldschmidt (1998) argues that, by designing in this manner, students are using the precedent to demonstrate their wisdom in following prominent examples to support their design. Apart from mimicking images online, TDL tutors often feel inclined to “explain everything” to diffuse students’ cloud of confusion (Green & Bonollo, 2003), dispensing images of exemplar projects as a form of “quick fixes” for learners’ inspiration/adherence. After all, most tutors’ pedagogical practices mimicked their own learning experiences or relied on their institutions (Grasha, 1996; Goldschmidt et al., 2014; Moore, 2001). Despite first-year learners enjoying the certainties played out in these M&A design reviews, this process of “copying, editing, and pasting” results in dire repercussions for the development of agile design thinking.

Generation Z students are also reported to have reduced patience in their communication and to crave instantaneous replies to their work (Opris & Cenușă, 2017; Sladek & Grabinger, 2014). While their eagerness is often generalized as a generational trait of self-centeredness, research has revealed that their impatience to seek out changes quickly is focused on yielding better results (Sladek & Grabinger, 2014). Their aim to excel academically is considered paramount. Being sheltered from stressors, closely monitored, and pushed to shine has created enormous pressure to desire immediate academic success (Duse & Duse, 2016) in feeding their extrinsic gratifications.

CONCEPTUAL FRAMEWORK - CRYSTALISING S.I.R.'S PEDAGOGICAL FRAMEWORK

The proposed S.I.R. pedagogical framework addresses two main challenges. First, improving the career attributes and soft/social skills of Generation Z learners, increasing their readiness to enter an increasingly collaborative workforce. Secondly, initiating and inculcating lifelong SDL mindsets to anticipate skillsets and traits deemed essential for future job profiles (Davidson, 2012; Dell Technologies & Institute for the Future, 2017; Koh & Lee, 2008; Organisation for Economic Co-operation and Development, 2018).

The following sections bridge desirable SDL behaviours (Gibbons, 2003; Tan et al., 2011) with secondary research in mapping Generation Z’s learning dispositions and characteristics to conceptualize the S.I.R. non-hierarchical studio pedagogical model (illustrated in Figure 2). This resultant S.I.R. framework is characterized by the three distinct mechanisms impacting both the design curricula and studio pedagogy constructs. This paper focuses exclusively on SDL Stage 1, “Ownership of Learning” and Stage 2, “Self-Management and Monitoring;” Stage 3, “Extension of Learning,” is excluded here as it is less feasible to be under the purview of the design tutor.

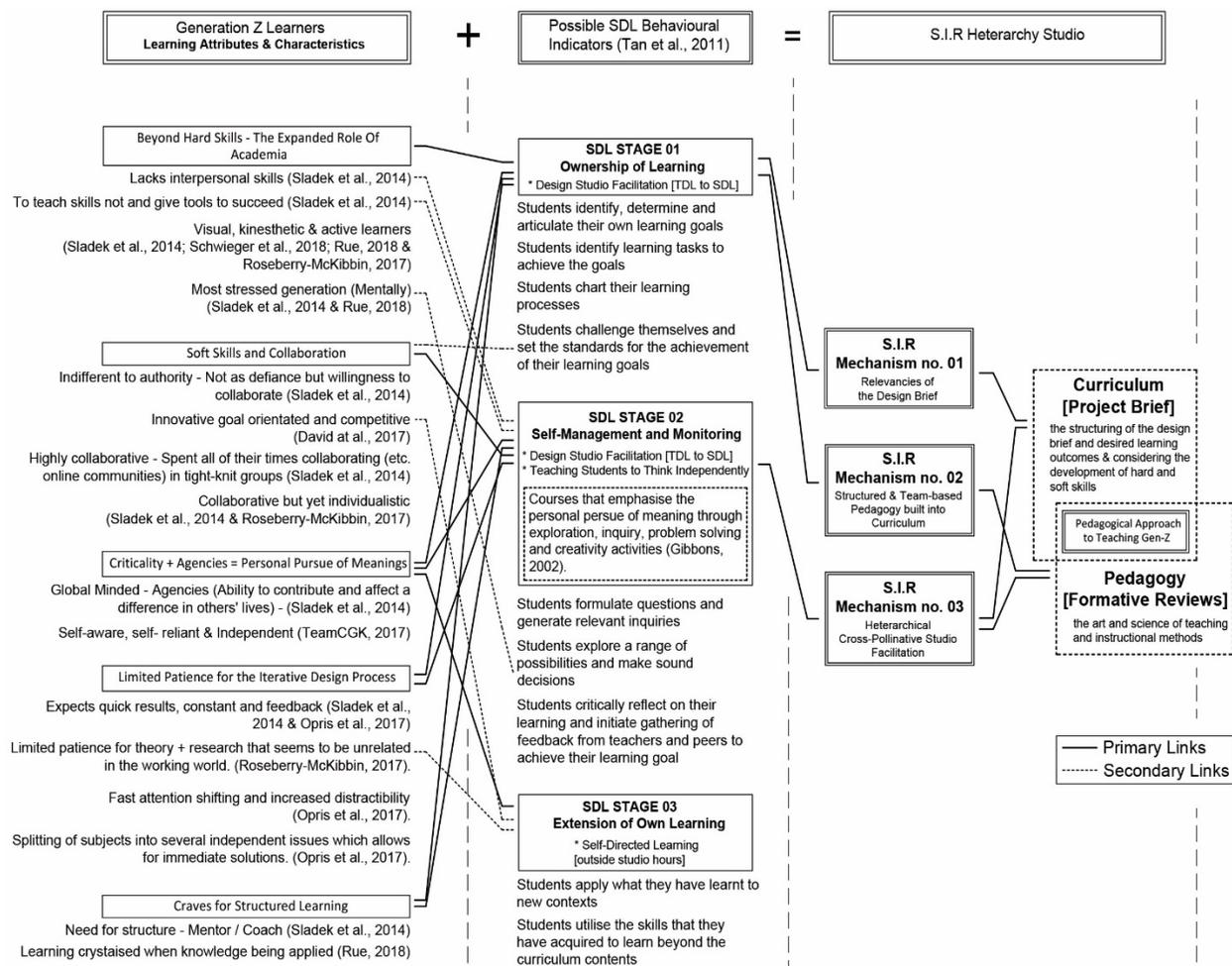


Figure 2. Conceptual Framework – Mapping of the SDL characteristics with Gen-Z’s learning dispositions.

## S.I.R. Stage 01 - Ownership of Learning + Generation Z Learners

The elusive SDL jigsaw piece of unlocking learners' intrinsic motivation, as a prelude to students taking control of their learning, remains a mystery. According to SDL researchers (Brockett & Hiemstra, 1994), students' dispositions, readiness for SDL, and learning attributes are quintessential "cornerstones" in shaping SDL mindsets. In reality, not all newly enrolled learners are ready for SDL. Numerous first-year Generation Z students are pressured to hastily select their field of study based on interest, intuition (Parker, 2017), and, sometimes, according to their parents' wishes. Affinities for their chosen disciplines do not necessarily equate to them embarking on positive learning endeavours in developing SDL traits. These early choosers may regret their decisions after experiencing challenging situations (Parker, 2017), leading to attritions.

### *S.I.R. Mechanism no. 01 – Relevancies of the Design Brief*

Design studios cannot operate in an insular environment (Deamer, 2020), within an intellectual bubble. Unfortunately, our design briefs are often conceived to detach from realism for fear of deterring student creativity. As a counterpoint, the narrative of S.I.R.'s design brief capitalizes on Generation Zs' desire to be globally/civically engaged with contemporary issues and their eagerness to affect change (Rue, 2018). Fresh perspectives and empathies are brought to the surface through real-world challenges (hypothetical/live projects) that serve as previews of how students can expand their agencies beyond academia. For example of an architecture project brief, for example, academics can facilitate design discussions around the United Nations' Sustainable Development Goals guidelines. The United Nations seeks to address current global challenges, including poverty, inequality, climate change, environmental degradation, peace, and justice (United Nations., n.d).

Sustained passion in developing their academic/career trajectories is something students learn not in lectures but, rather, as non-cognitive traits developed over time (Chen et al., 2015; Jachimowicz, 2019; O'Keefe et al., 2018). Researchers have related empowerment, affirmative effects (favourable emotions), positive engagements (involvement and satisfaction for work), to passion for one's profession (Perrewé et al., 2013). The resultant attribute of perseverance emerges as a reliable predictor of students sustaining their efforts and interests over time despite failure and adversity in their education (Duckworth et al., 2007). S.I.R. tutors optimistically tease out these desired mindsets thru a relevant design brief and the conversational "problem-based learning" pedagogy.

### *S.I.R. Mechanism no. 02 – Structured Design Milestones and Team-based Pedagogy Built Into Curricula*

It is highly beneficial to provide structured frameworks in scaffolding Generation Z's learning (Duse & Duse, 2016; Roseberry-McKibbin, 2017; Sladek & Grabinger, 2014). Providing greater clarity in studio learning refers not necessarily to dogmatic M&A pedagogy, but to redesigning a project brief's structure by guiding learners with methodical, step-by-step, linked design activities. Even with S.I.R.'s project briefs embedding degrees of certainties and securities (common instructions and milestones) into the iterative design process, learners eventually produce varying design outcomes due to their diverse interpretations.

These shared milestones are distributed as "small wins," bite-sized interdependent phases, presented weekly, and allowing for quicker resolution and feedback (Opriş & Cenuşă, 2017; Sladek & Grabinger, 2014)." Small wins are emotional moments often marked by struggle and/or frustration, and help learners gain momentum (Sterzinger, 2019). Common milestones also encourage formative design critiques to be aligned across peers as breeding grounds for cross-pollinating, team-based pedagogy. Learners are likely to develop close camaraderie in the tightly knitted group. The S.I.R.'s team-based learning environment differs significantly from the ubiquitous

group/teamwork arrangements, where students cooperate on a singular submission on which they usually embark with an individualistic “*divide and conquer*” mindset.

### S.I.R. Stage 02 – Self-management and Self-monitoring + Generation-Z Learners

SDL’s “self-managing and monitoring” can be inculcated within S.I.R.’s heterarchical design studio’s cross-pollinating discursive learning environment. “Self-management” is characterized by students managing their learning tasks, goals, and resources, while “self-monitoring” involves internal thinking processes, reflection, and the strategizing of improvements in their learning (Tan et al., 2011). Brockett et al. (1994) clarified that SDL is not a phenomenon in which students are assumed to be self-directed from the beginning; instead, tutors help ignite students’ readiness through a methodical TDL approach in classrooms. The initial TDL teaching methodology does not necessarily equate to the hierarchical M&A pedagogy. In the early stages of Generation Z’s design education, the TDL-driven pedagogy will benefit students who have not experienced the peculiarities of the design studio. This inductive mode of studio facilitation gradually fades away as learners become autonomous and confident in leading/co-leading design critiques and their self-directing group learning sessions (Liow, 2019).

### *S.I.R. Mechanism no. 03 – Heterarchical Cross-Pollinative Studio Facilitation*

S.I.R.’s heterarchical pedagogy model of learning in collaborative team/group scenarios is designed to align with Generation Z’s learning preferences (Roseberry-McKibbin, 2017; Sladek & Grabinger, 2014). The S.I.R. Studio is a radical change for design tutors, shifting their roles from that of the sole purveyor of knowledge to that of a neutral facilitator/coach. Rather than solely adopting Grow’s tutor-dependent SSDL model, the tutors’ transitional roles are guided through a structured design brief with explicit assignments corresponding to varying levels of design tasks to match the desired mode of facilitation throughout the project.

In the non-hierarchical S.I.R. studio, tutors model and instill ideal SDL (ownership of learning and self-managing and monitoring) behaviours as students observe and re-enact by modelling these traits in their self-directed peer-to-peer critiques outside formal studio hours. Through this discursive approach, both learners and tutors extend their design knowledge as they formulate their queries and explore a broader spectrum of design solutions. Taking cues from Generation Z’s strong preference for active learning (Rue, 2018), tutors actively induce peer-to-peer cross-pollination/critique. S.I.R. tutors choreograph a safe learning environment for students to normalize failures as natural aspects while they discuss and negotiate throughout the iterative process. Student engagement is heightened as learners collectively make design decisions in collective brainstorming exercises. Furthermore, peers’ active participation in the tightly knitted group’s design journey ignites and sustains students’ passion for their projects (Perrewé et al., 2013). A typical scenario of a non-hierarchical S.I.R. studio facilitation is illustrated in Figure 3, below.

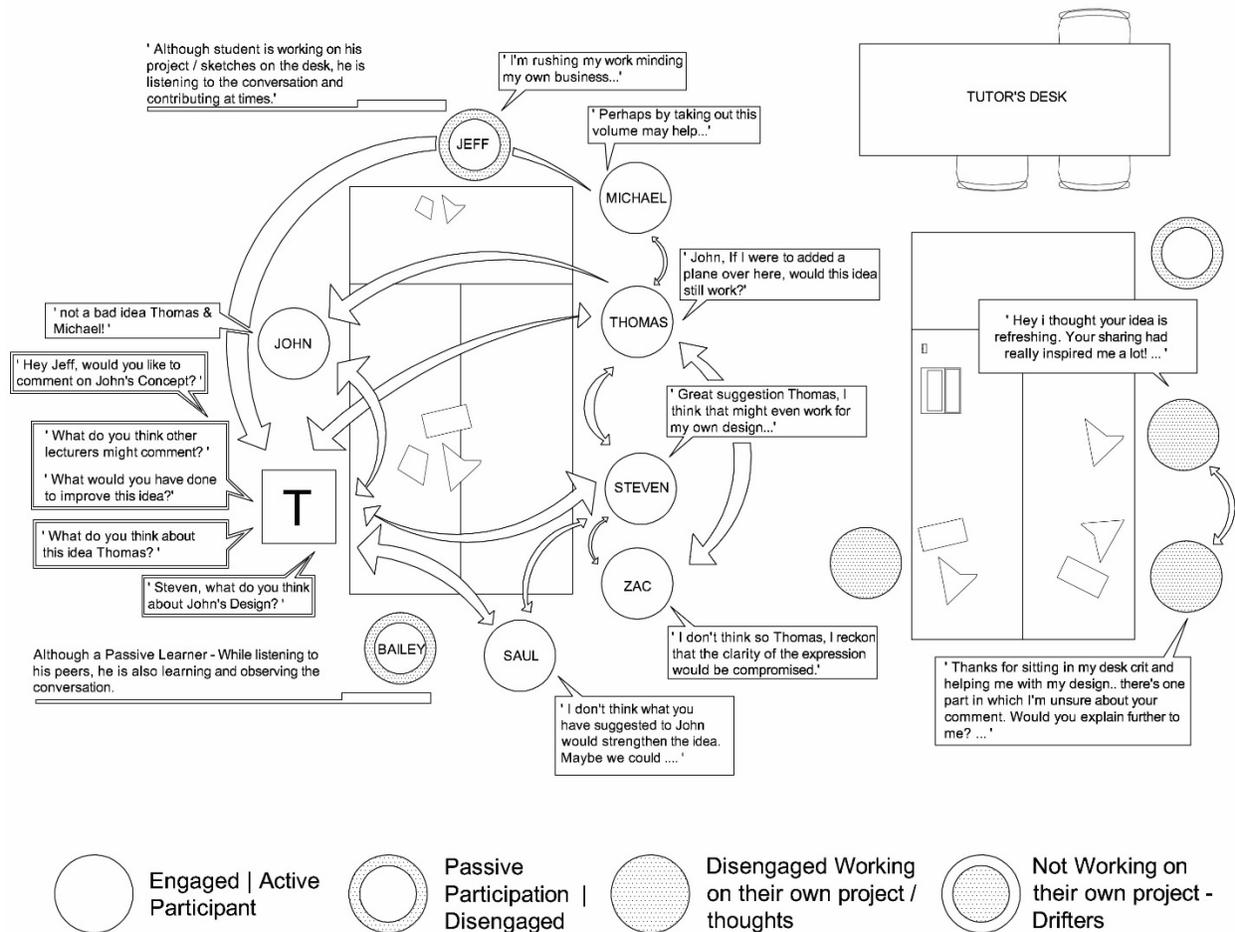


Figure 3. A typical scenario of a S.I.R. formative review (Liow, 2016).

Engaging in “design” motivates young people. Learning through communal design activities spur the development of soft skills of being reflective, self-directed, and working proficiently in teams (Davis et al., 1997). The collaborative S.I.R. learning environment aims to spur students’ development of their non-cognitive skills, personal responsibility, autonomy, and to establish meanings in their SDL education journey (Candy, 1991). Moreover, both the World Economic Forum (2018) and Sladek and Grabinger (2014) stressed the importance of Generation Z students developing career traits and character dispositions such as negotiation, emotional intelligence, and empathy. These attributes, which are essential for the future, are often difficult to teach (Smith & Hu, 2013) and mostly overlooked in traditional design pedagogical methods (Hu-Au & Lee, 2017).

### ADDITIONAL PROJECTED OUTCOMES AND VALUES

Although S.I.R is designed to develop Generation Z’s non-cognitive skills and SDL mindsets as desirable traits for the future, its collaborative approach stimulates the building of academic buoyancies and has the potential to be infused in the pedagogy of non-allied disciplines.

## Building Learners' Academic Buoyancy/Resilience

Students with prior STEM education usually face initial struggles in adapting to the idiosyncrasies of the design studio. Uncertainty lies at the heart of teaching and learning in art and design education (Orr & Shreeve, 2019; Tracey & Hutchinson, 2016) and students must be able to accept and thrive on being uncertain during various stages of the design process (Land et al., 2008). Learners studying in an authoritative M&A environment are more likely to undergo prolonged stressful periods, experience diminished interest in their studies, and eventually withdrew from their studies (Liow, 2019). The same research suggests that, compared to the M&A model, S.I.R.'s cross-pollinating environment enables learners to normalize daily design setbacks and contributes to a favourable student retention rate (Liow, 2019).

Martin and Marsh (2008) described this phenomenon as “academic buoyancy”—the ability to overcome the setbacks and challenges of everyday academic life. S.I.R. tutors enlist students' participation and capitalize on the exchanges of design critiques as feedback to breed buoyant mindsets (ahmed Shafi et al., 2017). The key to optimizing learners' academic results is to guide them on ways to respond to feedback and disappointments (ahmed Shafi et al., 2017) as “reflection-on-action” (Schön, 1991). Students cultivating close and supportive friendships can strengthen their academic resilience (Graber et al., 2015). Moving beyond academic buoyancy is the development of “mental resilience/agility.” The mental agility to deal with continual disruptions while preserving psychological balances in unfamiliar situations (Harari, 2018) is advantageous for the future workforce's ever-changing nature.

## S.I.R. Studio Pedagogy in Transdisciplinary Applications

In recent years, Design has extended its influences into numerous non-allied fields. Martin's “Business Design” (BD), as expanded from Tim Brown's “Design Thinking” (DT) championed by IDEO, has found its way into the business world and as courses offered by institutes of higher learning. Entrepreneurs and organizations from non-designing fields have capitalized on DT and BD as vehicles for creating user-centred products and services. The research-driven methodology, e.g. data collection through ethnographic techniques (Fraser, 2012), actively engages both designers and non-designers in the heterarchical design process. The design studio thus remains a vital incubation space/activity in which design thinking occurs from the initial stages of ideation to the validation of prototypes. The ethos of DT/BD lies in the invitation of consumers—being non-designers—participating as co-designers (Fraser, 2012). Without the Master Designer dictating the process and outcome, the studio mechanism bears significant resemblances to the S.I.R. heterarchical studios. With S.I.R. students well-attuned to the flattened hierarchical working/learning culture, they will find themselves fitting comfortably into the highly collaborative, design-led transdisciplinary teams of the future.

The studio model's emergence as a pedagogical model/methodology to advance knowledge is increasingly interwoven into non-design disciplines. The influences of the design studio are finding their way into business schools (Bandera et al., 2019), STEM fields (Dionne & Huston, 2015) and creative writings domains (Carpenter et al., 2013). While the studio's popularity has grown enormously with its increased relevance to non-allied disciplines, the pedagogical advantages of the studio would be nullified if tutors led with an instructive M&A approach. Unless facilitated in a non-hierarchical pedagogical framework, the studio is reduced to the pervasive TDL model, re-enacting the M&A pedagogy already ubiquitous in classrooms worldwide.

## CONCLUSION – AN EMERGING MODEL OF A RELEVANT STUDIO PEDAGOGY

The role of education is no longer to provide human resources to address the current workforce (Tan et al., 2011), but to develop learners' non-cognitive traits in anticipation of an unpredictable economy. As notions of "design" are projected to expand through emerging transdisciplinary collaborative practices, the ubiquitous M&A studio pedagogy based on intuitions or tutors repeating the M&A authoritarian teaching practices they have experienced previously (Grasha, 1996; Goldschmidt et al., 2014; Moore, 2001) must be urgently questioned. The M&A pedagogy of the Studio Masters instructing from their preferred design approaches and aesthetics is contradictory to academia's aim of knowledge generation.

In conceiving an appropriate studio experience for Generation Z learners, secondary data is synthesized to shape the foundations of the S.I.R. studio pedagogical framework. S.I.R.'s mechanisms draw relevancies for Generation Z students by redesigning the curricula and the project brief, dismantling the hierarchical M&A pedagogy, and choreographing the discursive studio critiques, all with the aim of developing SDL mindsets and soft skills. The S.I.R. studio promotes structured activities to support student acquisition of agency by igniting intrinsic motivations. As education is also concerned with character building, empowerment, enabling, and the ability to intervene in our world, the S.I.R. pedagogy has a broader objective than simply training learners to be competent in the design process. Students glean various non-cognitive skills in the S.I.R. studios are likely to be better positioned to face an increasingly precarious future.

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## REFERENCES

- Agency. (2020). In *Merriam-Webster*. Retrieved from <https://www.merriam-webster.com/dictionary/agency>
- ahmed Shafi, A., Hatley, J., Middleton, T., Millican, R., & Templeton, S. (2017). The role of assessment feedback in developing academic buoyancy. *Assessment & Evaluation in Higher Education, 43*(3), 415–427. <https://doi.org/10.1080/02602938.2017.1356265>
- Bandera, C., Somers, M., Passerini, K., Naatus, M. K., & Pon, K. (2019). Disruptions as opportunities for new thinking: Applying the studio model to business education. *Knowledge Management Research & Practice, 18*(1), 81–92. <https://doi.org/10.1080/14778238.2019.1621225>
- Brockett, R. G., & Hiemstra, R. (1994). *Self-direction in adult learning: Perspective on theory, research and practice* (Theory and Practice of Adult Education in North America Series) (1st ed.). Abingdon-on-Thames, United Kingdom: Routledge.
- Bryant, C., Rodgers, C., & Wigfall of alma-nac, T. (2018). The changing forms and values of architectural practice. *Architectural Design, 88*(5), 6-13. Wiley.
- Candy, P. C. (1991). *Self-direction for lifelong learning: A comprehensive guide to theory and practice* (Jossey Bass Higher & Adult Education Series) (1st ed.). Jossey-Bass.
- Carpenter, R. G., Valley, L., Napier, T., & Apostel, S. (2013). Studio pedagogy: A model for collaboration, innovation, and space design. In *Cases on higher education spaces: Innovation, collaboration, and technology* (pp. 313-329). Pennsylvania, United States of America: IGI Global.
- Chen, P., Ellsworth, P. C., & Schwarz, N. (2015). Finding a fit or developing it. *Personality and Social Psychology Bulletin, 41*(10), 1411–1424. <https://doi.org/10.1177/0146167215596988>

Cowell, R. (2006). Towards knowledge societies. UNESCO World Report. UNESCO Publishing, Paris, 2005, 226pp. ISBN 92-3-104000-6. *Practice Development in Health Care*, 5(1), 48–49. <https://doi.org/10.1002/pdh.173>

Davidson, C. N. (2012). *Now you see it: How technology and brain science will transform schools and business for the 21st Century*. Penguin.

Davis, M., Hawley, P., McMullan, B., & Spilka, G. (1997). *Design as a catalyst for learning*. Association for Supervision and Curriculum Development

Deamer, P. (2020). Design pedagogy: The new architectural studio and its consequences. *Architecture\_MPS*, 2–8. <https://doi.org/10.14324/111.444.amps.2020v18i1.002>

Dell Technologies, & Institute for the Future. (2017). *Realizing 2030: A divided vision of the future*. <https://www.delltechnologies.com/content/dam/delltechnologies/assets/perspectives/2030/pdf/Realizing-2030-A-Divided-Vision-of-the-Future-Summary.pdf>

Design Education Review Committee. (2019). Charting the future of design education. In *Design Education Review Committee Report*. Design Singapore Council. <https://www.designsingapore.org/resources/design-education-review-committee-report.html>

Dewey, J. (1923). *Democracy and education: An introduction to the philosophy of education*. Macmillan.

Dionne, R., & Huston, D. (2015). Studio-STEM: Application of studio teaching methods to the STEM classroom. In *SoTL Commons Conference*. <https://digitalcommons.georgiasouthern.edu/sotlcommons/SoTL/2015/102>

D'Ippolito, B. (2014). The importance of design for firms' competitiveness: A review of the literature. *Technovation*, 34(11), 716–730. <https://doi.org/10.1016/j.technovation.2014.01.007>

Duckworth, A. L., Peterson, C., Matthews, M. D., & Kelly, D. R. (2007). Grit: Perseverance and passion for long-term goals. *Journal of Personality and Social Psychology*, 92(6), 1087–1101. <https://doi.org/10.1037/0022-3514.92.6.1087>

Duse, C. S., & Duse, D. M. (2016). The teacher of the generation Z. *Edu World 2016 - 7th International Conference*. [https://www.academia.edu/30071766/The\\_teacher\\_of\\_Generation\\_Z\\_doc\\_2\\_pdf](https://www.academia.edu/30071766/The_teacher_of_Generation_Z_doc_2_pdf)

Fraser, H. M. A. (2012). *Design works: How to tackle your toughest innovation challenges through business design*. University of Toronto Press.

Gibbons, M. (2003). *The self-directed learning handbook: Challenging adolescent students to excel*. Jossey-Bass.

Goldschmidt, G. (1998). Creative architectural design: Reference versus precedence. *Journal of Architectural and Planning Research*, 15(3), 258-270. <http://www.jstor.org/stable/43030466>

Goldschmidt, G., Casakin, H., Avidan, Y., & Ronen, O. (2014). Three studio critiquing cultures: Fun follows function or function follows fun? In *DTRS 10: Design Thinking Research Symposium 2014*, Purdue University. <https://doi.org/10.5703/1288284315933>

Graber, R., Turner, R., & Madill, A. (2015). Best friends and better coping: Facilitating psychological resilience through boys' and girls' closest friendships. *British Journal of Psychology*, 107(2), 338–358. <https://doi.org/10.1111/bjop.12135>

Grasha, A. F. (1996). *Teaching with style: A practical guide to enhancing learning by understanding teaching and learning styles*. Alliance Publishers.

Green, L. N., & Bonollo, E. (2003). Studio-based teaching: history and advantages in the teaching of design. *World Transactions on Eng. and Tech. Edu*, 2(2), 269-272.

[http://www.wiete.com.au/journals/WTE&TE/Pages/Vol.2,%20No.2%20\(2003\)/GreenBonollo10.pdf](http://www.wiete.com.au/journals/WTE&TE/Pages/Vol.2,%20No.2%20(2003)/GreenBonollo10.pdf)

Grow, G. O. (1991). Teaching learners to be self-Ddirected. *Adult Education Quarterly*, 41(3), 125-149. <http://www.famu.edu/sjmga/ggrows>

Harari, Y. N. (2018). *21 Lessons for The 21St Century*. Signal.

Hertenstein, J. H., Platt, M. B., & Veryzer, R. W. (2013). What is “good design”? An investigation of the complexity and structure of design. *Design Management Journal*, 8(1), 8–21. <https://doi.org/10.1111/dmj.12000>

Hu Au, E., & Lee, J. J. (2017). Virtual reality in education: A tool for learning in the experience age. *International Journal of Innovation in Education*, 4(4), 215. <https://doi.org/10.1504/ijie.2017.10012691>

Jachimowicz, J. M. (2019, October 15). 3 reasons it’s so hard to “follow your passion.” *Harvard Business Review*. <https://hbr.org/2019/10/3-reasons-its-so-hard-to-follow-your-passion>

Jamieson, C. (2011). *The future for architects?* RIBA. [https://www.researchgate.net/publication/240916942\\_The\\_future\\_for\\_Architects](https://www.researchgate.net/publication/240916942_The_future_for_Architects)

Koh, T. S., & Lee, S. C. (2008). *Information communication technology in education: Singapore’s ICT masterplans, 1997-2008*. World Scientific Pub., Cop.

Land, R., Meyer, J., & Smith, J. (2008). *Threshold concepts within the disciplines*. Sense Publishers.

Lemke, C. (2002). *enGauge 21st century skills: Digital literacies for a digital age*. Office of Educational Research and Improvement (ED). <https://eric.ed.gov/?id=ED463753>

Liow, Z. (2016). Studio pedagogy’s operative framework for the 4th industry revolution. *Project to Practice: Innovating Architecture*. [https://www.researchgate.net/publication/314430486\\_Studio\\_Pedagogy’s\\_Operative\\_Framework\\_for\\_the\\_4th\\_Industry\\_Revolution](https://www.researchgate.net/publication/314430486_Studio_Pedagogy’s_Operative_Framework_for_the_4th_Industry_Revolution)

Liow, Z. (2019). Crossing the finish line together: Collaborative team learning in design studios. In *DRS Learn X Design 2019 Fifth International Conference for Design Education Researchers “Insider Knowledge,”* Middle East Technical University. Ankara, Turkey. <https://doi.org/10.21606/learnxdesign.2019.09062>

Lukianoff, G., & Haidt, J. (2019). *The coddling of the American mind: How good intentions and bad ideas are setting up a generation for failure*. Penguin Books.

Martin, A. J., & Marsh, H. W. (2008). Academic buoyancy: Towards an understanding of students’ everyday academic resilience. *Journal of School Psychology*, 46(1), 53–83. <https://doi.org/10.1016/j.jsp.2007.01.002>

McPeck, K. T. (2009). *Collaborative design pedagogy: A naturalistic inquiry of architectural education*. Texas A&M University.

McPeck, K. T., & Morthland, L. (2010). Collaborative design pedagogy: An examination of the four levels of collaboration. In *Design & Complexity: Design Research Society International Conference*. <http://www.drs2010.umontreal.ca/data/PDF/085.pdf>

Moore, K. D. (2001). The scientist, the social activist, the practitioner and the cleric: Pedagogical exploration towards a pedagogy of practice. *Journal of Architectural and Planning Research*, 18(1), 59-79. <https://www.jstor.org/stable/43030559>

O’Keefe, P. A., Dweck, C. S., & Walton, G. M. (2018). Implicit theories of interest: Finding your passion or developing it? *Psychological Science*, 29(10), 1653–1664. <https://doi.org/10.1177/0956797618780643>

- Oprîş, I., & Cenuşă, V.E. (2017). Subject-spotting experimental method for Gen Z. *TEM Journal*, 6, 683-692.
- Organization for Economic Co-operation and Development. (2018). The future of education and skills: Education 2030. [http://www.oecd.org/education/2030/E2030%20Position%20Paper%20\(05.04.2018\).pdf](http://www.oecd.org/education/2030/E2030%20Position%20Paper%20(05.04.2018).pdf)
- Orr, S., & Shreeve, A. (2017). *Art and design pedagogy in higher education: Knowledge, values and ambiguity in the creative curriculum*. Routledge, Taylor & Francis Group.
- Ostwald, M. J., & Williams, A. (2008). *Understanding architectural education in Australasia*. Australian Learning and Teaching Council and Carrick Institute for Learning and Teaching in Higher Education.
- Parker, K. F. (2017). *Generation Z Under Academic Pressure*. [www.mediapost.com](http://www.mediapost.com).  
<https://www.mediapost.com/publications/article/309010/generation-z-under-academic-pressure.html>
- Perrewé, P. L., Hochwarter, W. A., Ferris, G. R., McAllister, C. P., & Harris, J. N. (2013). Developing a passion for work passion: Future directions on an emerging construct. *Journal of Organizational Behavior*, 35(1), 145-150.  
<https://doi.org/10.1002/job.1902>
- Popkova, E. G. (2018). Preconditions of formation and development of Industry 4.0 in the conditions of knowledge economy. *Industry 4.0: Industrial Revolution of the 21st Century*, 169, 65-72. [https://doi.org/10.1007/978-3-319-94310-7\\_6](https://doi.org/10.1007/978-3-319-94310-7_6)
- Powell, W. W., & Snellman, K. (2004). The knowledge economy. *Annual Review of Sociology*, 30(1), 199-220.  
<https://doi.org/10.1146/annurev.soc.29.010202.100037>
- Pressman, A. (2014). *Designing relationships: the art of collaboration in architecture*. New York, United States of America: Routledge, Taylor & Francis Group.
- Roseberry-McKibbin, C. (2017). Generation Z Rising. *The ASHA Leader*, 22(12), 36-38.  
<https://doi.org/10.1044/leader.ae.22122017.36>
- Roy, R., & Riedel, J. C. k. h. (1997). Design and innovation in successful product competition. *Technovation*, 17(10), 537-594.  
[https://doi.org/10.1016/s0166-4972\(97\)00050-3](https://doi.org/10.1016/s0166-4972(97)00050-3)
- Rue, P. (2018). Make Way, Millennials, Here comes Gen Z. *About campus: Enriching the student learning experience*, 23(3), 5-12. <https://doi.org/10.1177/1086482218804251>
- Schön, D. A. (1987). *Educating the reflective practitioner: Toward a new design for teaching and learning in the professions*. Jossey-Bass.
- Schön, D. A. (1991). *The reflective turn: Case studies in and on educational practice*. Teachers College Press.
- Schwieger, D., & Ladwig, C. (2018). Reaching and retaining the next generation: Adapting to the expectations of Gen Z in the classroom. *Information Systems Education Journal (ISEDJ)*, 16(3), 45-54. <https://files.eric.ed.gov/fulltext/EJ1179303.pdf>
- Singh, A. (2014). Challenges and issues of Generation Z. *IOSR Journal of Business and Management (IOSR-JBM)*, 16(7), 59-63.  
<https://pdfs.semanticscholar.org/b109/73a5c6d11f37542adc34455bb0c7fbcbbb9d.pdf>
- Sladek, S., & Grabinger, A. (2014). Gen Z - The first generation of the 21st century has arrived! XYZ University.  
[https://www.xyzuniversity.com/wp-content/uploads/2018/08/GenZ\\_Final-dl1.pdf](https://www.xyzuniversity.com/wp-content/uploads/2018/08/GenZ_Final-dl1.pdf)
- Smith, J., & Hu, R. (2013). Rethinking teacher education: Synchronizing eastern and western views of teaching and learning to promote 21st century skills and global perspectives. *Education Research and Perspectives*, 40(1), 86-108.

- Sterzinger, N. K. (2019). *Good teaching: How small wins in the classroom can lead to big wins for education* [Thesis]. <https://repository.arizona.edu/handle/10150/634313>
- Tan, S. C., Divaharan, S., Tan, L. L. W., & Cheah, H. M. (2011). *Self-directed learning with ICT: Theory, practice and assessment*. Ministry of Education, Educational Technology Division.
- Tomanović, S. (2012). Agency in the social biographies of young people in Belgrade. *Journal of Youth Studies*, 15(5), 605–620. <https://doi.org/10.1080/13676261.2012.663893>
- Tough, A. M. (1967). *Learning without a teacher: A study of tasks and assistance during adult self-teaching projects*. Ontario Institute for Studies in Education.
- Tracey, M. W., & Hutchinson, A. (2016). Uncertainty, reflection, and designer identity development. *Design Studies*, 42, 86–109. <https://doi.org/10.1016/j.destud.2015.10.004>
- Tucker, R. (2017). *Collaboration and student engagement in design education*. Information Science Reference, IGI Global.
- Tucker, R., & Reynolds, C. (2006). The impact of teaching models, group structures and assessment modes on cooperative learning in the student design studio. *Journal for Education in the Built Environment*, 1(2), 39–56. <https://doi.org/10.11120/jebe.2006.01020039>
- Tucker, R., & Rollo, J. (2003). Cross-discipline collaboration and innovation in the design studio: Drawing on the Bath model. *Design+ Research: Project Based Research in Architecture*.
- United Nations. (n.d.). *Take Action for the Sustainable Development Goals*. Retrieved September 20, 2020, from <https://www.un.org/sustainabledevelopment/sustainable-development-goals/>.
- Venturini, G. (2019). Atlas of emerging practices: Being an architect in the 21st Century. New Generations Cultural Association.
- Villa, D., & Dorsey, J. (2017). The state of GEN Z 2017: Meet the throwback generation. The Center for Generational Kinetics. <http://3pur2814p18t46fuop22hvvu.wpengine.netdna-cdn.com/wp-content/uploads/2017/04/The-State-of-Gen-Z-2017-White-Paper-c-2017-The-Center-for-Generational-Kinetics.pdf>
- Vockley, M., & Lang, V. (2008). *21st century skills, education and competitiveness*. Tucson, AZ: Partnership for 21st Century Skills. <https://files.eric.ed.gov/fulltext/ED519337.pdf>
- Wallis, L. H., & Williams, A. (2012). Researching the one-on-one from a learning and teaching perspective. In *Design Research Society*. <https://www.semanticscholar.org/paper/Researching-the-one-on-one-from-a-learning-and-Wallis-Williams/f856d2cbaa992d49c2a4df84a964e331b40a1171>
- Wilson, S. E., & Zamberlan, L. (2017). Design pedagogy for an unknown future: A view from the expanding field of design scholarship and professional practice. *International Journal of Art & Design Education*, 36(1), 106–117. <https://doi.org/10.1111/jade.12076>
- World Economic Forum. (2018). The future of jobs report. World Economic Forum. [http://www3.weforum.org/docs/WEF\\_Future\\_of\\_Jobs\\_2018.pdf](http://www3.weforum.org/docs/WEF_Future_of_Jobs_2018.pdf)