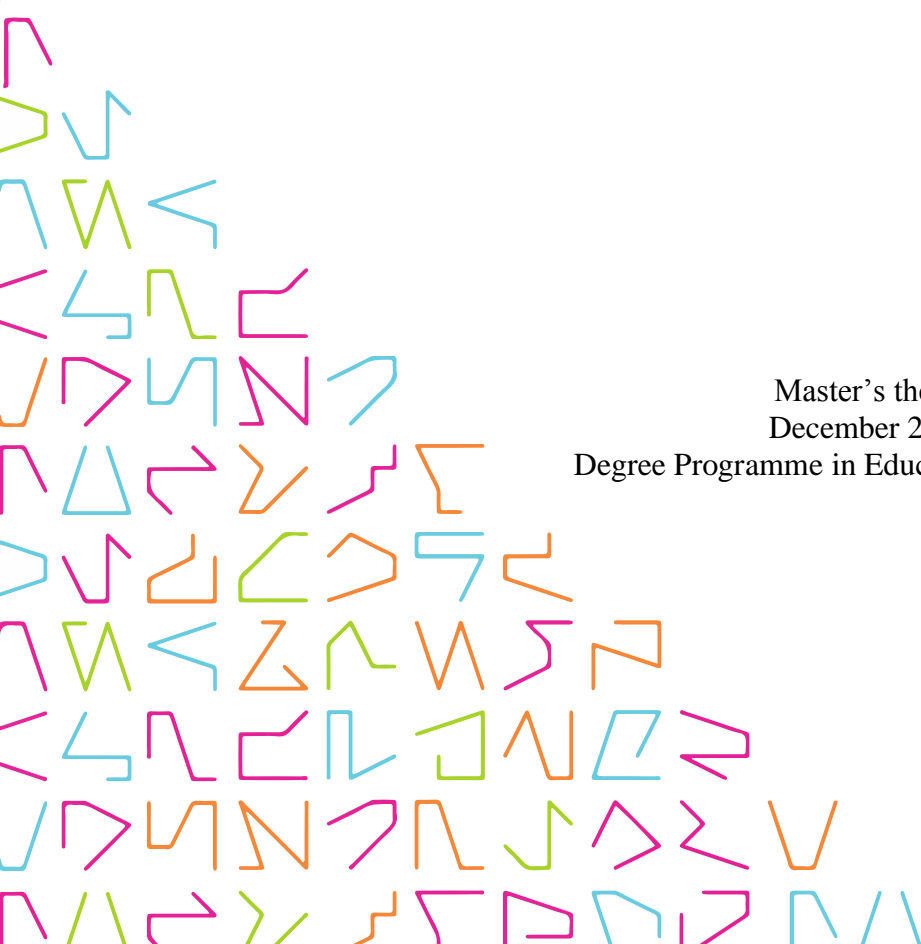


# **ENABLING INNOVATION THROUGH MINDSET**

**Private Schools in Dubai, United Arab  
Emirates**

Francesca Affleck

Master's thesis  
December 2018  
Degree Programme in Educational Leadership



## **ABSTRACT**

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**AFFLECK FRANCESCA:**  
Enabling Innovation Through Mindset  
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The purpose of this thesis was to understand the mindset of leaders, teachers and students towards innovation. In doing so, it set out to find what schools know about, and how they respond to innovation, which skills enable innovation and what barriers prevent it from becoming systematic in schools.

Qualitative research, in the form of semi-structured interviews, was conducted with leaders of innovation in ten schools. Innovation leaders, who volunteered to be interviewed, represented a relatively broad sample of schools.

Results analysed show that a key barrier to innovation is how misunderstood it is and how it is often inextricably linked to technology. Other factors such as time and curriculum constraints are also cited as barriers. Whereas growth mindset, and leaders who instilled a culture of innovation, were the key factors that enabled innovation. Skills of innovative students and staff were analysed and compared to skills of innovators at organisation level.

The findings indicate that the first step in enabling innovation in schools is for all stakeholders to have a deeper understanding of what it is. The literature review combined with analysis of results show that mindset and school culture can enable innovation. Further research, combining quantitative data with a wider range of stakeholders, would benefit a future study.

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Key words: innovation, mindset, technology, skills, enable, barrier

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# 1 INTRODUCTION

## 1.1 Innovation in a school context

Innovation is a word that is used increasingly in organisations, governments and schools, in books, articles, policies, websites and on social media sites. Innovation weeks, innovation spaces, and innovation roles have become a trend. A number of these are focussed on, or relate to, science and technology but what really is innovation and how can it be given the best chance to flourish in schools?

The definition of innovation in the Oxford dictionary is “the introduction of new things, ideas or ways of doing something” (Oxford University Press 2018). According to the Oslo Manual, an innovation is “the implementation of a new or significantly improved product (good or service) or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations” (OECD<sup>1</sup> / Eurostat 2005). It also classifies innovation into four main types:

A **product innovation** – a new or significantly improved good or service which includes “significant improvements in technical specifications, components and materials, incorporated software or other functional characteristics” (OECD / Eurostat 2005).

A **process innovation** - the implementation of a new or significantly improved production or delivery method which includes significant changes in techniques equipment and / or software.

A **marketing innovation** – significant changes in product design that are part of a new marketing concept.

An **organisational innovation** - a new organizational method in business practices, workplace organisation or external relations (OECD / Eurostat 2005).

There have been many references to innovation in an organisational context but what does innovation look like in an educational context? Kirkland and Sutch define innovation as “the application of a new resource or approach that changes social practice, creating some value.” (Kirkland and Sutch 2009). They go on to specify that “ within education, this

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<sup>1</sup> The Organisation for Economic Co-operation and Development (OECD) has 36 member countries and provides evidence-based reports and policies that aim to improve the economic and social well-being of people around the world.

can be the application of a new approach to questioning, the use of a digital tool or a novel use of space – that brings about some value by altering the social practice of teaching and learning’ (Kirkland and Sutch 2009). Couros defines it as “a way of thinking that creates something new and better” (Couros 2015). He emphasises the reference to thinking, as opposed to innovation being a thing.

Hargreaves says that in education, new products are unlikely but teachers constantly make process innovations which may be seen in daily activities such as the way they plan or teach lessons and in the way they interact with parents and students. He goes on to say that for teachers, “innovation is mainly a matter of learning to do things differently in order to do them better” (Hargreaves 2003). He notes that these innovations are often incremental rather than radical and don’t always have to be technological but can be “innovation in professional methodology” (Hargreaves 2003).

Kirkland and Sutch (2009), suggest that the word innovation has become overused and therefore has lost its true meaning, even becoming degraded. Serdyukov specifies three essential steps to innovation in a school context: “An idea, its implementation, and the outcome that results from the execution of the idea and produces a change.” (Serdyukov 2017).

## **1.2 Innovation in private schools in Dubai, United Arab Emirates (UAE)**

Innovation is a high on the UAE National Agenda Vision 2021 launched by H.H. Sheikh Mohammed Bin Rashid Al Maktoum, Vice President and Prime Minister of the UAE and Ruler of Dubai. One of the Vision 2021 priorities, is forming a competitive, knowledge-based economy (UAE National Agenda Vision 2021, 2018). As a result, the UAE National Innovation Strategy aims “to promote innovation in the education sector by introducing creative teaching methods and techniques, as well as designing and developing innovative curricula that equip students with 21st century skills and knowledge” (UAE National Innovation Strategy 2015).

Schools in the UAE are varied in the curriculum they offer. Government schools (approximately 60% of schools) across the country, follow the Ministry of Education (MoE) curriculum while private schools follow the curriculum of their own country.

Dubai has the largest number of private schools, that grow considerably, year on year, to meet the needs of Dubai's expatriate population (export.gov 2018). These schools are overseen by Knowledge and Human Development (KHDA), established in 2007.

Regardless of their curriculum, all schools across the country are evaluated using the UAE School Inspection Framework (2015-2016), in six performance standards: students' achievement; students' personal and social development and their innovation skills; teaching and assessment; curriculum; the protection, care guidance and support of students and leadership and management. Innovation is measured against five out of the six key performance indicators: students' learning skills and their social responsibility and enterprise, innovation in teaching, curriculum adaptation and leadership (KHDA 2018).

Countries around the world, including the United Arab Emirates, have developed policies that include a STEM (Science Technology Engineering and Mathematics) programme to develop innovators in the fields of science and technology. The UAE has set itself ambitious targets: to become one of the top ten countries in the world in the Global Innovative Index (GII)<sup>2</sup>, and its students to achieve the top 20 PISA<sup>3</sup>, Programme for International Student Assessment scores (UAE Government 2015).

### **1.3 Objective, purpose and questions**

The objective of this thesis is to identify, through the eyes of leaders in private schools in Dubai, what the mindset of teachers and students towards innovation is and what enables innovation in young learners. This thesis aims to drill down to what it is that can encourage, foster and grow innovators, or future innovators, at a young age. The purpose of this thesis is to establish a picture of innovation in education in schools and bring about a change in the thinking of teachers in the UAE so that they feel empowered to use innovation in their practice to develop young students into innovators.

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<sup>2</sup> Global Innovation Index (GII) measures the innovation performance of 126 countries.

<sup>3</sup> Programme for International Student Assessment (PISA) tests the knowledge and skills of 15-year old students worldwide, every three years.

**Research Question:**

What is the mindset of teachers and students towards innovation in private schools in Dubai?

**Sub questions:**

What are the skills and behaviours that contribute to an innovator's mindset?

What are the barriers to an innovation mindset?



## 2 LITERATURE REVIEW

### 2.1 Innovation in organisations

There are a number of theories about innovation in the organisation and to a lesser extent, innovation in schools. For the purpose of this study, we begin with a brief look at which skills innovative leaders, in organisations, have. According to Graham-Leviss (2016), innovation is critical in a knowledge economy and yet as a quality, it is difficult to cultivate. In her article in Harvard Business Review (December 20, 2016) she uses an infographic, produced by XBIInsight, after analysing data involving 5,000 leaders, and suggests they are traits or behaviours that innovative leaders should possess or aspire to.

#### What Innovative Leaders Do Better Than Noninnovative Ones

And an area where they fall short, based on surveys of nearly 5,000 leaders across a wide range of industries.

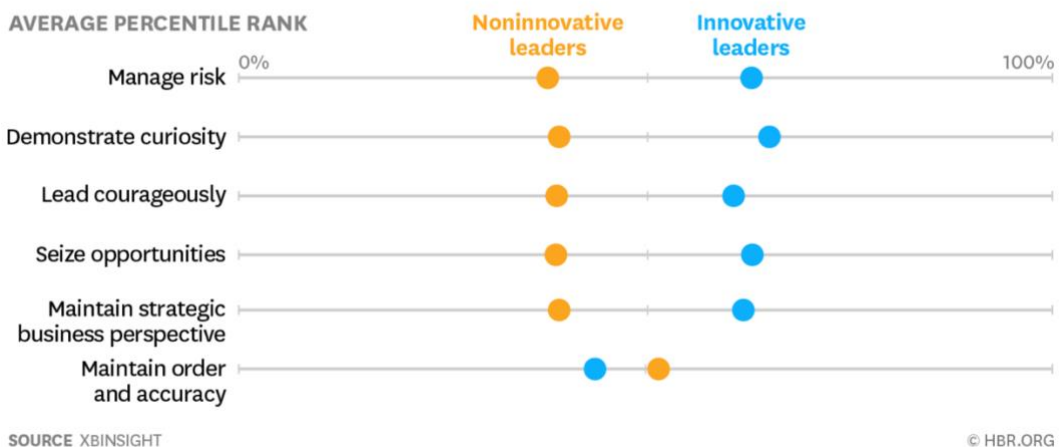


FIGURE 1: What Innovative Leaders do Better than Noninnovative ones (Graham – Leviss 2016, XBINSIGHT 2017)

Although organisations need to experiment with new ideas to stay ahead of the game, risks need to be minimised or managed and that is what innovative leaders in the study did. They also demonstrated curiosity, constantly seeking to find out more and learn more, develop skills and create a learning environment for others. Tough decisions are inevitable and so innovative leaders need to lead with courage and confidence. “ The CEOs who are most likely to lead innovation are driving, high-impact individuals, who aren’t afraid to be assertive, independent, and above all, curious” (Graham-Leviss 2016).

## **2.2 Innovation in schools**

In education, innovation can appear as a new pedagogic theory, methodological approach, teaching technique, instructional tool, learning process, or institutional structure that, when implemented, produces a significant change in teaching and learning, which leads to better student learning. Serdyukov (2017).

The following paragraphs focus on pedagogy, tools, approaches and trends that are commonly believed to foster innovation in schools.

### **2.2.1 Innovation and technology**

Theories about innovation in schools, generally discuss the relationship between technology and innovation. For example, according to OECD (2016), digital technology can facilitate:

- Innovative pedagogic models
- Simulations such as remote or virtual online laboratories
- International collaborations, overcoming barriers of geography and formal classroom hours.
- Real-time formative assessment and skills-based assessments
- E-learning, open educational resources mainly aimed at autonomous learners. (OECD 2016).

Three advantages of using computers highlighted by Falch and Mang (2015) are that the pace can be adjusted to the individual learner; students are more engaged and it makes it easier for teachers to monitor. For all these reasons, one of the most notable changes is that schools have increased the number of computers per student (Vincent-Lancrin et al (2017).

However, with these come associated costs for schools and students at home. Falch and Mang (2015) study the effects of using computers to aid learning from various studies and conclude there are mixed results. They maintain that project-based learning can be as innovative as methods of learning that involve computers and internet-based teaching and learning.

Today, makerspaces, a spinoff of technology, give students the opportunity make and build through hands on activities using tools such as 3D printers, laser cutters (Van Holm 2015), robotics, coding and animation software including virtual reality.

New approaches to teaching and learning need to respond to changing contexts such as the need for a knowledge economy (Kirkland and Sutch 2009) or to phenomenon such as globalisation. Crucial to this are factors like, “motivation to develop professionally, availability of opportunity to engage in innovation, the skills for testing the validity of new knowledge and sharing innovation.” (Hargreaves 2003).

Increased use of technology in schools, means that teachers need to be trained to deliver lessons using technology or use it to measure students’ progress. Freeman et al (2017, 28) have cited countries such as New Zealand who have invested heavily not just in technology, but equally, in the training or upskilling of their teachers. The challenges linked to teacher training are not new, and have been discussed by several studies such as Hargreaves (1998) where he highlighted the need for radical reforms in initial teacher training. Twenty years on, a few countries have invested in reforms in their teacher training. Examples of countries that have begun to introduce technology and innovation into initial teacher training are Finland’s Aalto University and University of Helsinki who offer a Diploma in Innovation in Education and Dublin City University’s Institute of Education which has a new STEM department that trains educators in Ireland and the USA’s Digital Promise programme that trains teachers in computational thinking. (Freeman et al 2017). Singapore’s National Institute of Education, which focuses their teacher training on pedagogy, is followed by 100 hours of professional development that teachers can use flexibly to ensure they are up to date with changes in teaching practice (OECD 2010).

### **2.2.2 Innovation and STEM**

STEM, with its real-life, inquiry-based problem solving and blended learning across all four subjects really began to become a trend in education in around 2005 (Siliconrepublic 2017) and is still at the forefront of education systems around the world (OECD 2016), including the UAE (UAE Government 2015), by countries wanting to promote a knowledge-based economy. However, there are equally important arguments that subjects such as science, technology, engineering and mathematics, although crucial for the economy, somehow takes the emphasis away from other subjects and so there are many who have stepped in to diversify STEM into STEAM which includes art, design

and humanities (Freeman et al 2017), STREAM which adds in reading and writing (Root Bernstein 2011), and STEMIE, to include innovation and entrepreneurship (The Stemie Collection 2018).

Avvisati et al (2013) believe that diverse qualifications are required to produce innovators. They claim that only half of highly innovative people have a background in STEM subjects such as: maths and science (7.8%) engineering or computing (16.5%), and STEM related fields such as health, architecture and agriculture (16.4%). However, the other half have degrees in business (17.5%), education (11.4%), social sciences (11.1%) and other non-STEM fields.

### **2.2.3 Innovation, leadership and policy**

An innovative leader does not even need to be the person who creates the idea behind an innovation. (Jeffrey Baumgartner, Enterprise Innovation, 2018)

Couros (2015) argues that everyone is a learner and that learning is about making connections, even if it means taking risks and trying something new. “In order to have innovative learners, we need innovative educators and in order to have innovative educators, we need innovative leaders.” (Couros 2015).

Kirkland and Sutch (2009) maintain that leadership, particularly distributed leadership, creates and supports a culture that nurtures innovation. Learning leadership studies by OECD (2013) conclude that innovation depends on leaders at all levels. According to Colvin, Fortune’s 2017 world’s greatest leaders teach us three lessons: acknowledge reality and offer hope, bring followers physically together and build bridges. He also maintains that, “great leaders can be anywhere - at the helm of a giant corporation, running a rural college or in a cramped office exerting influence through sheer personal energy.” (Colvin 2017).

Doss (2013) writes about leaders being self-aware so they are prepared for constant change personal growth and life-long learning. Schools are developing deeper learning approaches through their policies. They are redesigning learning spaces such as libraries which are becoming learning hubs. New learning spaces are very different to traditional classrooms but instead are arranged in ways that support deeper learning approaches.

However, leaders and policy makers need to keep up with new changes in what works, as new tools, theories and programmes emerge. According to OECD (2016) education policies have traditionally been focusing on STEM to foster innovation. However, they now suggest that STEM fosters only certain types of innovation and therefore education policy makers need to consider a wider range of competencies that promote innovation.

### 2.2.4 Innovation and 21<sup>st</sup> century skills

21<sup>st</sup> century learning is about how knowledge is generated and applied, about shifts in ways of doing business, of managing the workplace or linking producers and consumers, and becoming quite a different student from the kind that dominated the 20<sup>th</sup> century. What we learn, and how we are taught is changing. This has implications for schools and higher level education, as well as for lifelong learning. (Andreas Schleicher, OECD Educations Directorate, OECD 2018).

So what are the 21<sup>st</sup> century skills that will develop innovators? Avvisati et al (2013) believe that the most important, critical skills that innovators have are: coming up with new ideas and solutions; the willingness to question ideas; the ability to present ideas in an audience; alertness to opportunities and analytical thinking. These conclusions were as a result of two international surveys that covered 20 countries where they interviewed graduates, five years after their graduation, about the importance of 19 skills.

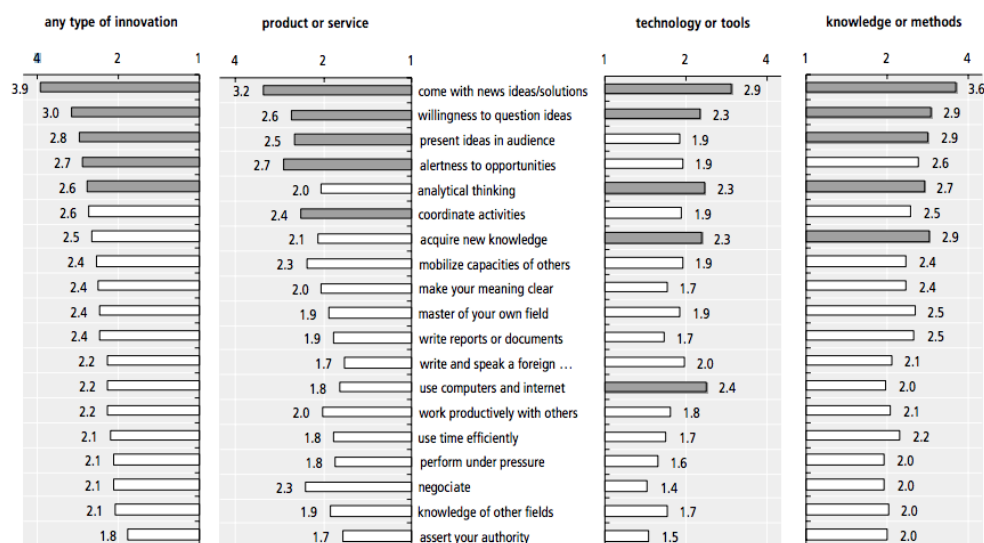


FIGURE 2: Critical skills for the most innovative jobs (Avvisati et al 2013)

Freeman et al (2017) suggest that innovative schools provide students with leadership opportunities “to build strength of character, communication and social and emotional skills” (Freeman et al 2017, 13). They cite schools that use project-based initiatives to “encourage learners to be passionate and inventive about solving problems” (Freeman et al 2017, 24) and also discuss the importance of authentic learning experiences using real world problems both in and out of the classroom, to engage learners and develop their lifelong learning skills.

Engaging students in deeper learning approaches such as critical thinking, higher-order thinking skills, problem-solving, inquiry-based learning collaboration and self-directed learning, active learning promote innovation (Freeman et al 2017).

Finland’s **transversal competences** offer a holistic solution based on the latest research knowledge from a variety of sources, including, but not only, PISA scores. The Finns believe that in order to succeed in life, students need to develop:

- Thinking skills and learning to learn
- Cultural competence, interaction and expression
- Managing daily life, taking care of oneself and others
- Multiliteracy
- IT competence
- Working life skills and entrepreneurial competence
- Participation, involvement and building a sustainable future (Finnish National Agency for Education, Curriculum 2014)

Finland introduced **Phenomenon Based Learning** (PhenoBL) based on constructivist learning theories where students find learning meaningful through a “360degree perspective in real-world, natural context through problem based inquiry learning” (Silander 2015). In order to give students access to a breath of subjects, subjects are still taught but some are delivered using real-world phenomena as a base, while crossing boundaries between subjects. Students are given the opportunity to choose questions to investigate which involve collaborative learning, technology and involving experts in the field (Finnish National Agency for Education, Curriculum 2014). Such links are crucial for students to see how what they are learning is linked to real world careers and events such as global crises and new phenomena such as ‘fake news’ according to Kirsti Lonka, a professor of Education at Helsinki University (Spiller 2017).

In Finland, this reform is aimed particularly at middle school teachers who usually prefer to teach their own subjects. Teachers are now required to work on cross-curricular topics with their colleagues at least once a year for an extended period, twice in Helsinki schools. The new requirement aims to actively engage not only every student, but also every teacher in phenomenon based learning (Sahlberg 2018).

PhenoBL, was introduced in a school in Al Ain, United Arab Emirates, using stories as a theme for active and cross-curricular learning. Using Running Records screening, the number of non-native English speaking Emirati children's reading skills at ages 6-7 was measured and showed that at an accuracy level of 90-94% increased from 6% at the beginning of term 1 to 30% at the end of term 3. Children's enthusiasm for reading increased, which also had an impact on listening and writing skills which in turn had an impact in other areas such as comprehension of tasks in Maths and Science. It also meant that teachers collaborated more in their planning however the biggest challenges in this project were the need for resources, adequate planning time and professional development of teachers (Valanne et al 2017).

FIGURE 3: A study of PhenoBL in Al Ain, UAE (Valanne et al 2017).

Singapore, currently the country with the highest PISA scores, wants education “to be meaningful to students, instilling values and developing an **Applied Learning Programme** for real-world applications of knowledge and skills and Learning for life programme to develop character and values through real-life experiences.” (Ministry of Education, Singapore).

Funding for resources and training and time given to teachers to plan and facilitate this kind of learning is necessary if it is to become a reality in schools. In fact, providing **Authentic Learning Experiences** remains one of the biggest challenges according to the Freeman et al (2017), together with rethinking the roles of teachers who have to deliver these experiences.

### **2.2.5 Innovation and mindset**

Innovation is a competency, and much like other competencies, it can be built. (XBInsight 2017).

Mindset, was a word first used in 1920 in educational fields according to the Online Etymology Dictionary (2001 - 2018). Dweck (2006) believes that a 'fixed mindset' is what acts as a barrier to development while a 'growth mindset' does the opposite – enabling people to accomplish great things and develop innovative ideas.

Dweck holds that “people with a growth mindset believe intelligence can be developed” (Dweck 2006). A growth mindset, according to Dweck (2006), means a person or organisation looks for ways to improve themselves, by embracing learning, accepting challenges and being resilient.

Jamrisko and Lu (2018), relates Singapore's, ranking on Bloomberg's innovation ranking list this to the focus on STEM in their education system. However according to Ministry of Education website (Ministry of Education 2018), they also place an emphasis on values and their mission is to provide children with a balanced and well-rounded education. The article by Jamrisko and Lu (2018) goes on to quote Prinn Panitchpakdi, head of an investment group in Thailand who says one thing the USA, Korea and China have in common is that people accept failure as part of the process of innovation.

In an article for Harvard Business Review, Dweck says “it's not easy to attain a growth mindset. We all have our fixed mindset triggers. When we face challenges, receive criticism, or fare poorly compared with others, we can easily fall into insecurity or defensiveness, a response that inhibits growth.” (Dweck 2016).



## 2.3 Measuring Innovation

According to an OECD (2009) discussion paper, measuring innovation in education is in its infancy. It maintains that no single indicator has been developed to measure innovation. In 2017, a study by Vincent-Lacrin et al, used two approaches to measure innovation – using existing national innovation surveys and surveys of organisational change. They measured changes in educational organisations through international surveys such as PISA, Trends in International Mathematics and Science Study (TIMSS) and Progress in International Reading Literacy Study (PIRLS). They found that innovative schools related lessons to real life, higher order thinking skills and personalised learning and nurtured partnerships with other stakeholders, including parents and the community (Vincent-Lacrin et al 2017).

Of the 12 measures that Vincent-Lacrin et al (2017) used to measure innovation, Most changes are seen in:

- Availability of laptops or notebooks in schools
- Use of memorisation of facts and procedures as a pedagogical technique
- Using computers to practice skills and procedures
- Teacher collaboration in the form of peer observation
- Teacher collaboration through discussion with peers. (Vincent-Lacrin et al 2017).

Moderate changes are seen in:

- Using computer simulations for learning
- Public posting of school achievement data. (Vincent-Lacrin et al 2017).

Least changes are seen in:

- Possibility for students to design their own experiments
- Scope for students to explain ideas
- Explaining the relevance of science in everyday life
- Professional development for fostering students' critical thinking and problem-solving
- Parental involvement in school activities. (Vincent-Lacrin et al 2017).

PISA tests, first administered by OECD in 2000, and have become widely accepted as an international benchmarking tool for education systems around the world (Breakspear 2014) to compare their performance in skills related to reading, mathematics and science. In addition, every three years, an 'innovative domain' such as collaborative problem solving in 2015, is measured (OECD 2000). PISA results are now used by 80 countries

around the world and are used by policy makers at school, national and global level (Breakspear 2014).

## 2.4 Enablers of and barriers to innovation

At the core of successful innovation in schools is the relationship between the capacity and disposition of the innovator (micro level influencers) and the environment in which the innovation occurs (macro level) including **school cultures**, management structures and school infrastructure. (Kirkland and Sutch 2009)

A study about **learning environments** OECD (2013) concludes that in order for schools to promote deep learning or life-long learning, they need to foster **21<sup>st</sup> century competences**. Conclusions from various studies of educational leaders, teachers and policy makers suggested that innovation can be promoted when learning is collaborative, challenging, and takes into account individual differences in prior knowledge. Learners understanding how they learn, formative feedback and cross-curricular and extracurricular learning were also key factors (OECD 2013).

Hargreaves (2003) discusses the importance of **collaboration** or innovative networks which he says create a “peer-to-peer epidemic”. He acknowledges that technology has a role to play in spreading innovation. He also encourages schools to share their innovation by making an “open source culture” although he acknowledges that this does not always happen in a competitive climate.

In their literature review about barriers to innovation, Kirkland and Sutch (2009) note that barriers are referred to as first order barriers such as external elements such as a lack of resources, time and training, and second order barriers which revolve around **perceptions and attitudes** of people involved. They allude to a number of articles that suggest schools and teachers intrinsically find change difficult. Kirkland and Sutch (2009) suggest that the success of an innovation is dependent upon how people perceive how new or different the innovation is.

According to OECD (2016), innovation in education is a ‘highly contentious issue’.

When talking to education ministers one quickly gets the impression that education systems in general are very reluctant to innovate, and that there is strong resistance to change among teachers ---But talking to teachers gives one the opposite idea – that there are too many changes imposed on them without much consultation or the necessary preconditions for successfully implementing change. (OECD 2016)

Sutch et al (2008, p17), discuss factors that prevent teachers from engaging in educational innovation which include: risk of failure, risk of wasting time, risk of expenditure that couldn't be justified and risk of criticism from parents, inspectors, governors or students.

Hargreaves (2003) differentiates between material capital in a school (financial and physical) and intellectual capital (knowledge, skills, capabilities, competence, talents, expertise, practices and routines). But in addition to these he introduces the words **social capital**, which he describes as the level of trust between school leaders and staff and staff and students.

Technology is often seen as innovation, or as a tool to enable innovation however, its cost can be a barrier for some schools. Crosscombe (2018) questions if these attempts at becoming certified by Microsoft, Apple and Google is consumerism rather than innovating pedagogy. He suggests that this cost is not always financial but there is a pedagogical cost of introducing technology in schools. He maintains that “Technology must support pedagogical goals instead of directing them.” (Crosscombe 2018).

### **Visit to a Microsoft showcase school**

Students had access to Surface Pro 4 which allowed them to learn in so many different ways: they could type, write, draw, annotate, scan in, record, attach links, photographs and videos, access content that teachers had posted, get feedback in real time as well as after school. All their work was organized in one place making it more efficient, and allowed opportunities to collaborate and communicate.

Teachers could insert audio reflections as an alternative to marking which could make feedback more useful. They had access to all the student's screens so they can monitor progress in a task and link their own device to the whiteboard when necessary. If students have missed a lesson, they could catch up with the content on OneNote. The school has also switched to Office 365 so teachers could collaborate and share.

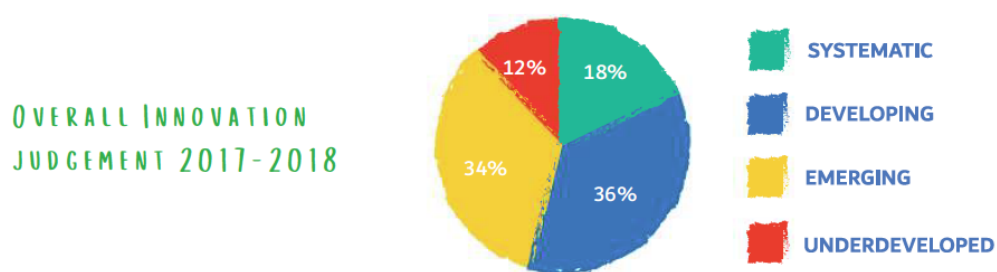
However, the drawbacks were the expensive devices meant parents needed to be convinced they were worth it. Wi-Fi strength was needed to support such a huge network, technical support, charging points and of course the cost of damaged, lost or stolen devices. In addition, the behaviour policy had to be rewritten and online safety made clear. Most importantly, staff needed to be trained and persuaded to change practiced methods of teaching to new ones. In fact, there was some staff attrition because they were not technologically minded. Could the school have lost teachers who were innovative in other ways?

FIGURE 4: Visit to a Microsoft showcase school.

Crosscombe's (2018) theory can be related to figure 4 above, on a visit to a Microsoft showcase school. Not only were there obvious costs of introducing the technology, there is potential for the cost of other pedagogical goals which can become lost in the background in an effort to drive forward technological transformation on such a large scale.

## 2.5 Current research in private schools in Dubai, UAE

Schools in Dubai are evaluated against how they promote innovation in five key areas such as learning skills, social responsibility and enterprise, teaching, curriculum adaptation and leadership. The Knowledge and Human Development Authority (KHDA 2018), responsible for inspections of private schools in Dubai, have analysed data from their school inspections in 2017 – 2018 as seen in figure 5 below:



Just over a half of schools enable students to develop learning skills that support innovative thinking.

There is a significant increase in the use of learning technologies by students to support their learning and enable them to think differently.

FIGURE 5: Overall innovation judgement of private schools in Dubai (KHDA 2018)

They conclude that “just over half of schools enable students to develop learning skills that support innovative thinking.” (KHDA 2018). This shows that there is a need for an understanding of what innovation is, particularly, as seen in the table below, in teaching skills.

In the table 1, is the breakdown of innovation measured against specific indicators. In schools where innovation is developed systematically, the highest percentage is awarded to leadership (20%). This is almost true (38%) for schools where innovation is developing but not for schools where innovation is emerging or under-developed.

TABLE 1: Innovation against specific indicators as measured by KHDA inspections in private schools in Dubai 2017-2018. (KHDA 2018)

	<b>Systematic</b>	<b>Developing</b>	<b>Emerging</b>	<b>Underdeveloped</b>
<b>Overall innovation</b>	18%	36%	34%	12%
<b>Learning Skills</b>	18%	36%	31%	15%
<b>Social Responsibility Skills</b>	18%	43%	31%	8%
<b>Teaching Skills</b>	17%	31%	36%	16%
<b>Curriculum Adaptation</b>	19%	39%	34%	8%
<b>Leadership</b>	20%	38%	30%	12%

Fees for private schools in Dubai can range widely and this may have an effect on innovation in schools. Lubienski (2009) suggests that autonomy from regulation, choice and competition between schools may have an effect on innovation. Greany (2016) says that because schools then become selective and spend a lot of money on attractive facilities, parents may choose them over others. This of course does not work as favourably for schools at the other end of the spectrum which may suffer from budget constraints and therefore find it difficult to close the gap that is seen in figure 5.

### **Skills and Mindset in innovative schools in Dubai**

As seen in the literature review, innovation is not all about technology. A report by KHDA (2017) outlines three steps to support innovation in schools. The first is through holistic learning where they also maintain that whilst technology is definitely part of the future, the human experience is equally if not more important. The report cites skills such as collaboration, problem solving, application of knowledge, citizenship, tolerance and teamwork as skills of the future. The report also takes note of the fact that students in some schools related innovation to a growth mindset. The second is student engagement

and student voice and the third, encouraging partnerships, connections and links that were both students and staff benefited from (KHDA 2017).

This emphasis on innovation by the government and education authorities, has brought innovation to the forefront. This view is held by Kirkland and Sutch (2009) who suggest that a shared vision from a local and national perspectives is important to promoting innovation.

## **2.6 Synthesis of theories**

### **2.6.1 Definitions of innovation**

There are many definitions of innovation, theories that are linked to promoting it and a few ways to measure innovation in schools. But what are schools to make of some of these, sometimes conflicting, messages?

From the definitions of innovation, at the beginning of this chapter, the words and phrases that come to the forefront are that innovation is an idea, something new, something better, something significantly improved, something that creates value, results in a change, or even, a way of thinking. In reality, at a school level, what does this mean?

For the purpose of this thesis, in order to enable innovation in schools, the following definition has been developed:

***Innovation is a new or improved idea or solution which, when actioned, achieves improved outcomes for a member / members of the school community.***

It is crucial to point out here that the scale of innovation can be small to begin with, but with growth mindsets, good leadership and collaboration, it can lead to significant transformation.

## **2.6.2 Tools, trends and programmes that schools use to promote innovation**

### **Technology**

There is no doubt that technology can play a part in teaching computation and design thinking, promote research and productivity or develop collaboration and entrepreneurship and therefore plays a part in promoting innovation in schools but the idea that it is synonymous with innovation and one cannot exist with the other is what can act as a barrier.

While technology in classrooms enable some of these approaches, they are not impossible to foster without (Falch and Mang 2015). Innovation in education is not synonymous with technology but technology can support better teaching and learning (OECD 2016). It is crucial though, that pedagogy should be supported but not directed by technology (Crosscombe 2018).

### **STEM**

How will exposure to STEM trigger innovative ideas in a wide spectrum of students, not all of whom are interested in STEM – or are we closing doors to some? And what of teachers and students who excel or innovate in other areas of the curriculum or even areas outside the curriculum? Are we stifling them or inadvertently saying they are not as important?

Simply increasing the focus on STEM in schools isn't necessarily going to fill that gap in our future economies (OECD 2016). Nor are we be able to predict what other gaps may arise in our rapidly changing world. Billimoria (2017) refers to STEM as 'a one-dimensional solution whereas the reality of economic development and growth is multidimensional'.

It is true that problem solving and critical thinking are fostered through the STEM subjects and they are crucial skills and there is no doubt that we will always need people to step up to those fields of education to fill gaps that exist and will possibly continue to get wider as trends towards an increasingly digital world consume us.



What we need is a generation that will be ready to step up to any challenge, to predict them even before they arise and find innovative solutions. Speakers at the World Economic Forum (2018) speak of the importance of soft skills and how crucial it is that they are taught in schools.

### **Leadership and Policy**

Alongside the approaches to innovation discussed above, come challenges of resources, both physical and human, often in an economic environment where funding for such development are hard to find and this is where innovative leaders and policy makers play a crucial role. Leaders and policy makers need to consider not just the physical costs but also the costs involved in training teachers. Serdyukov (2017) cites research that proves that teacher education and professional development need to be innovated because ‘teachers must be taught to teach well’.

Leaders are also crucial to enabling innovation, by creating an environment where every member of the school community should feel empowered to bring solutions or ideas, no matter how small, or how different. Without an environment in which they can feel empowered, innovative ideas may lie dormant in many minds. Serdyukov (2017) maintains that a barrier to innovation is its disruption of everyday routine and how it puts people out of their comfort zones. He says that those schools where innovation does succeed, do so because leaders create an innovative culture.

### **21<sup>st</sup> century skills**

In order to develop innovation, there are many skills that need to be fostered. These have been studied by Freeman et al (2017) in their study of innovative K-12 schools, and in organisations as seen in figure 1 and figure 2. In addition to some of the skills identified, Finland’s transversal competences (Finnish National Agency for Education, Curriculum 2014) throw into the mix, cultural competence, IT competence and sustainability which put those skills into the context of a globalisation and 21<sup>st</sup> century reality. Leadership and management are crucial to providing that culture or environment that encourages risk-taking which is one of the main skills linked to innovation.

### **Mindset**

However, none of these trends, be it technology, STEM or 21<sup>st</sup> learning skills can be truly established unless they are enabled by an innovative culture, created by innovative leaders

or teachers in classrooms. Another enabler of innovation, that goes hand-in-hand with any of these tools or programmes, is a growth mindset. It is therefore reassuring to see growth mindset as the most popular trend in Education according to TeachThought (2018).

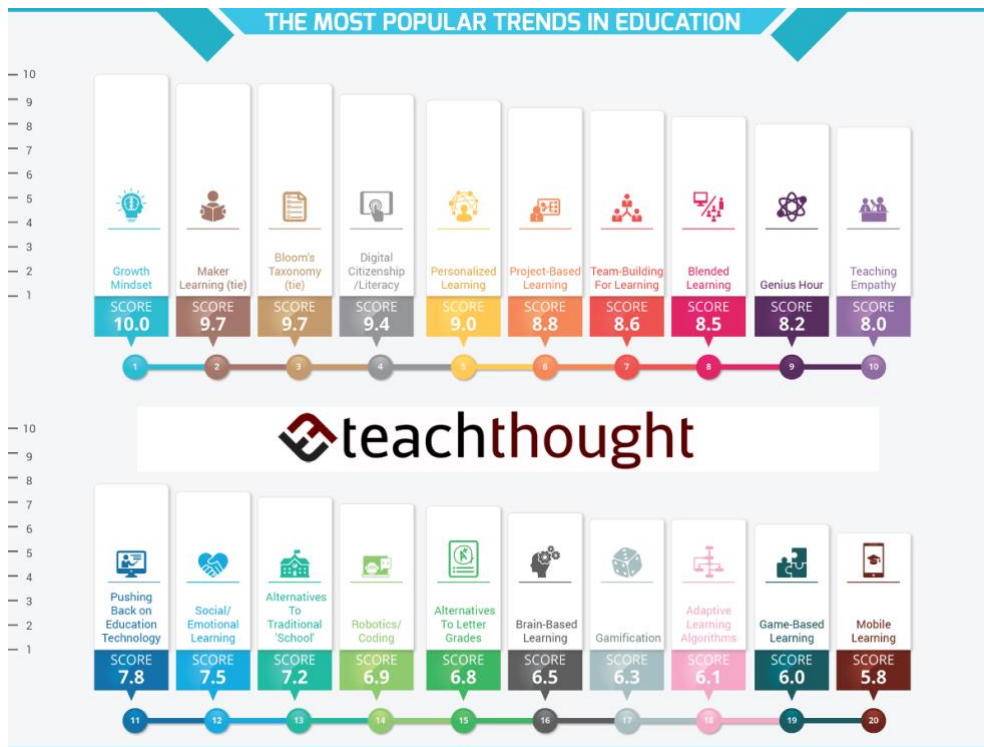


FIGURE 6: The Most Popular Trends In Education (TeachThought 2018)

Linking innovation to growth mindset is not new. There are a number of books and articles linking innovation to growth mindset in schools and organisations. However, this thesis suggests that cultivating a growth mindset at a younger age means that students of today will be become more open to innovation.

### 2.6.3 Measuring innovation

While it is recognised that measuring innovation in schools is relatively new, in the study by Vincent-Lacrin et al (2017), most changes were seen in the availability of laptops and use of computers and teacher collaboration and less so, developing communication, risk-taking and critical-thinking. This shows that schools have work to do in enabling innovation. This is also true for private schools in Dubai, from figure 5 and table 1 where just over half the schools demonstrate that innovation is developing or systematic.

OECD (2016) maintains that countries with greater levels of innovation have seen increases in certain educational outcomes, including higher mathematics performance, more equitable learning outcomes for students of all abilities and more satisfied teachers.

However, if we look at PISA as a way to measure innovation, it is argued that it should not be used as a definitive judgement of an education system as it “removes emphasis on social and emotional development, interpersonal and intrapersonal skills, civics, health and well-being.” (Breakspear 2014). Sahlberg (2018) questions if making changes based on these scores is the answer or focusing instead on good teaching and learning. So does achievement in PISA scores in schools enable innovation?

In the Harvard Business Review’s (2017) list of best performing CEOs, the top 5 were educated in Spain, the **USA**, France, **United Kingdom** and **Germany**. Three of these countries do appear in the Top 10 for global innovation (Global Innovation Index 2018). However, none of these countries rank in the Top 10 in PISA scores (Global Innovation Index 2018).

In order to test this further, in table 2 below, the top 10 countries with the highest scoring PISA scores were compared with the top 10 countries in the Global Innovation Index (2018). As a strong correlation was not observed, countries with the strongest universities (QS World University Rankings 2018) were added in.

If you look at the list for strongest tertiary education, three of the top 10 countries correspond with the top 10 PISA scoring countries. But, the United States, Germany and the UK, who score the highest university rankings do not score in the top 10 PISA scores.

The United States that ranks 5<sup>th</sup> in innovation output, ranks 29<sup>th</sup> on the scores for reading, mathematics and science. Serdyukov (2017) comments on what he calls a paradox, in his study on Innovation in Education in the USA.

Nevertheless, it is indeed a paradox that while the USA produces more research, including in education, than any other country (Science Watch, 2009), we do not see much improvement in the way our students are prepared for life and work. (Serdyukov 2017).

What are the United States, United Kingdom, Germany and the Netherlands doing to feature in the top 10 of the Global Innovation Index (2018) when their assessment scores in reading, maths and writing are not in the top 10? The answer seems to lie in strong tertiary education. In table 2, there is a stronger correlation between countries with the best tertiary education and innovative output. OECD (2011) report concludes that it is having a more educated work force gives countries ‘a head start in many high-skill areas.’ It might be that in a few years’ time, we see the current top 10 for PISA scores will be at the top of the Global Innovation Index. Or are PISA sceptics right about PISA tests not being a measure of innovation? (Owen 2017).

TABLE 2: Top 10 comparisons (Global Innovation Index 2018, QS World University Rankings 2018)

<b>Top 10 countries Assessment in reading, maths and science (Global Innovation Index 2018)</b>	<b>Top 10 strongest Higher Education Systems by Country (QS World University Rankings 2018)</b>	<b>Top 10 countries Global Innovation Index (Average of Input and Output sub scores) (Global Innovation Index 2018)</b>
<b>Singapore</b>	<b>United States of America</b>	Switzerland
HongKong	<b>United Kingdom</b>	<b>Netherlands</b>
Japan	<b>Germany</b>	Sweden
Estonia	Australia	<b>United Kingdom</b>
<b>Canada</b>	<b>Canada</b>	<b>Singapore</b>
<b>Finland</b>	France	<b>United States of America</b>
<b>Republic of Korea</b>	<b>Netherlands</b>	<b>Finland</b>
<b>China</b>	<b>China</b>	Denmark
Slovenia	<b>Republic of Korea</b>	<b>Germany</b>
<b>Ireland</b>	Japan	<b>Ireland</b>

### 3 METHODOLOGY

#### 3.1 Qualitative data collection

In trying to establish how innovators are grown this thesis seeks to use a mixture of theory, and qualitative data. Theory is primarily based on a plethora of reports and studies of innovation in organisations and schools. This is because there are not yet many theories that study innovation in schools, specifically. OECD reports have detailed information on what innovation is and how it is measured in schools. This evidence is fairly recent. In addition to academic research, books, such as and Dweck (2006) *Mindset: The New Psychology of Success* and Couros (2015), *The Innovator's Mindset* are considered, as these are written specifically in relation to young learners in schools and education.

A range of literature and analysis of innovator's skills, link theory to findings in the interviews about skills that contribute to an innovator's mindset and barriers to innovation in schools.

In deciding how many interviews to carry out in a qualitative study, Baker and Edwards (2012) suggest that it is impossible to decide at the start of the project, how many interviews to carry out as the interviews are exploratory. They do suggest that the number depends on the type of study. "Multiple interviews provide multiple data sources." (Johnson 1997, 289). Although the 10 interviews represents only a sample of the range of schools in the UAE that teach different curriculums, these schools are different and have different cultures and therefore provided a range of data.

The decision to interview specific schools in Dubai was based on the information in the KHDA (2018) research document which show that only 18% of private schools in Dubai, systematically and routinely using innovation. Therefore, representatives from private schools who lead innovation in their schools were chosen in the first instance. Nine out of the 10 interviewees are considered to be representative of the 109 private schools in Dubai that are were rated good or better in recent school inspections (KHDA 2018).

The schools are all private schools in Dubai with fees in the high range. They included profit and not for profit schools, IB and UK curriculum schools, primary and secondary

schools, and schools with teachers and students from a number of nationalities including Emiratis. Most were English National Curriculum schools and 9/10 of them were in the emirate of Dubai.

Blandford (2013) maintains it is important to consider people's motivations for taking part in interviews. All interviewees for the purpose of this thesis were volunteers who have a keen interest in innovation. One could argue that represents a certain sample of school leaders however, considering only 18% of schools in Dubai are evaluated as having systematic innovative practices (KHDA 2018), the interviews were carried out on a voluntary basis.

Most volunteers were leaders of innovation in their schools, a few had published educational articles. All were supportive of research and further study, and some were undertaking studies themselves in different Master's programmes. The interviewees were mostly (70%) male, and 40% of them were leaders of technology in their school. 80% of interviewees were also members of the senior leadership team in their schools.

The interview questions sought to understand the behaviours of leaders, staff and students that lead to innovator's mindset or act as barriers to innovator's mindset. Interviews were individual and semi-structured so as to let each leader relax, allow authenticity and allow for elaboration on answers where necessary. Semi-structured interviews also meant that interviewees could be asked probing questions for clarification, which "adds meaning and depth to the data" (Galletta 2013). This was particularly useful when the interviewee tended to talk briefly rather than elaborate. It was also useful when interviewees introduced a new term related to innovation that was not common to the other interviewees.

Semi-structured interviews were chosen as they give an insight to people's perceptions and experiences (Blandford 2013). These are crucial to the interview question which is exploring teachers' mindsets towards innovation, and their perceptions of skills that promote it or barriers. Face-to face interviews, ranging from 45 minutes to 90 minutes, allowed participants to express their opinions and ideas while being kept on task or on topic by the questions. Supplementary questions such as: "Can you elaborate?, tell me more", were asked in order to gain some depth and to get the interviewee back on track.

Although Blandford (2013) suggests that semi-structured qualitative studies do not usually start with a hypothesis, this thesis started with a hypothesis that technology, or the lack of it in some schools, is one of the barriers to fostering innovation and therefore seeks to discover what it is, besides technology, that can create future generation of innovators or in fact, an innovator's mind set.

### **3.2 Data analysis**

According to Birmingham and Wilkinson (2003), transcriptions are more reliable than notes and therefore, the interviews were recorded and transcribed using software to make efficient use of time and allow detailed analysis and interpretation.

After transcription, answers to each question were grouped together to 'allow themes, issues and concerns to be easily identified and quantified' (Birmingham and Wilkinson 2003, 63). However, while looking for ways to analyse or categorise interviewees responses, attention was also given to distinct or unique answers (Arksey and Knight 1999, 6).

In order to analyse the data, phases in line with to Braun and Clarke's (2006, 87-88) phases of analysis were carried out.

1. Familiarising with the data
2. Content analysis by grouping answers to questions together
3. Identifying common themes
4. Drawing out themes that emerged which were unexpected

The data from the interviews was cross checked with theory in order to give the research validity and enable conclusions to be drawn easily. Using theories already established in schools and comparing them to commonalities in the interviews ensured triangulation (Truckman and Harper 2012).

Hitchcock et al (1995) maintain that there is disagreement whether theories are developed alongside data or data is collected first and then analysed. They found from experience that there is a positive advantage in developing data collection and analysis side by

side For this thesis, theory was analysed first, then data collected and was followed up by more theory in order to synthesise the results.

### **3.3 Limitations of the research and future studies**

In this study of perceptions about innovation, only volunteers from private schools in Dubai were interviewed because of the availability of data of innovation measured in schools. There could be opportunities to extend this study to a selection of educational leaders, from a greater variety of schools, across the emirates. This might highlight different understandings of innovation and therefore give a broader range of what enables and what the barriers to innovation are, in a wider range of schools.

Whilst it was felt a qualitative study would allow to get deeper insights into the mindsets of leaders, teachers and students, a quantitative study alongside a qualitative one would collect data that could be analysed to support the qualitative data. For example, although the hypothesis about technology, or the lack of it, being a barrier to innovation in schools has been proved by participants' responses, quantitative data would be able to show to what extent this is true.

For the literature review, innovation in schools and measuring innovation in schools is relatively new and so there are relatively fewer articles and books related to the subject. A future study should seek to look at new and emerging studies about innovation in schools and how it is measured.

## **4 RESULTS**



## 4.1 Interviewee's perception of innovation

All participants were first asked to describe their own perceptions of innovation. It emerged that most of their perceptions had changed over time. Therefore this section separates their current definitions and what their understanding of innovation was in the past.

### 4.1.1 Participant's current definition of innovation

All but two of the interviewees mentioned the word 'new' in their definition of innovation. 5 out of 10 mentioned the word 'better' or 'improved'.

*It is not always something completely new but could be an existing idea that is improved. (G)*

7 interviewees linked the idea of **technology** to innovation and while they were aware that it wasn't the only way to innovate, they saw it as being really important for schools.

However there were also some unique ways of defining what it meant to them from an educational perspective. While 5 out of 10 described it as **finding a solution or problem solving**, a different and interesting word used by interviewee B was '**progress**' which he described as, *embodying new and better ways of doing something or solving a problem*. One defined innovation as constant **step-by-step improvement**.

Two of the 10 interviewees linked innovation to a **skill** and only one of these linked it to **mindset** when asked what their idea of innovation was. One interviewee got a group of students together to research, discuss and form their school definition of innovation and what it meant to them.

*I think innovation doesn't just come from one person I think it comes from a culture within the school (G).*

However, not all of them felt innovation was completely understood by teachers in their school. This is, later in this thesis, to be identified as a significant barrier.

#### **4.1.2 Changing perceptions of innovation**

Changes in perceptions and mindsets were also noted amongst teachers and students. Almost all (90%) of interviewees said their own perception of innovation had changed relatively recently. One of them said it was continually evolving. Most interviewees said their perception of innovation was previously linked to technology, creative design or '*something futuristic*' and believe that this misconception is commonly held by a vast majority of teachers in schools. Over time, they have come to see innovation as not necessarily linked to technology or even completely removed from it.

*I now realise that it is the small steps that count in getting to that big innovative leap. (G)*

Although a few interviewees indicated they thought that innovation in education is new, others believe that it has always been around, it was just never made explicit. An example by interviewee B, was that teachers are constantly finding ways to assess learning or develop strategies for students with special educational needs to access the curriculum and are constantly finding innovative ways to do this without realising that they are being innovative.

*Although my view on innovation has stayed the same, what has changed is that there is more of an onus on innovation in schools. Mankind has always been innovative – always tried to find a better way or an easier way of doing something whether that's because they wanted to do something that takes a shorter period of time or to find the best way of doing something. (J)*

So what was it that created a shift in 90% of the interviewees' perceptions of innovation to change and develop? One of the most common reasons for this was actually being given the role as innovation leader, which led them to 'dig deeper' to find the true meaning of innovation in an educational context. This study of innovation was carried out in a variety of methods by the interviewees, formally through a Master's programme, informal research and by sharing ideas on Twitter and other social media platforms. A

few of these leaders have set up their own online platforms, specifically for sharing ideas about innovation.

Two of the interviewees discussed how innovation has become a *buzz word* in education more recently. One even talked about how the term has become *debased* and *misunderstood*. A few of them talked about how its importance and awareness has increased recently, particularly in schools in the UAE as inspections focus on innovation as a priority. One interviewee who had recently moved to the UAE, felt that the emphasis on innovation was markedly increased in the UAE.

## **4.2 Perceptions of school leaders, teachers and students**

### **4.2.1 Innovation and mindset**

When asked what skills innovators have, interviewee C and J felt that it was a mindset rather than skills. H felt it was both.

*It's definitely a mindset - trying to be innovative in how we view the world and how we go about our daily lives and our business of teaching but also I think it's a set of skills as well. (H)*

*Definitely a growth mindset because you do have to take failure into account and you do have to be willing to try new things.(J)*

### **Leaders**

Interviewees felt that mindset had to be modelled by leaders in order to enable open mindsets amongst staff.

*Innovation needs to be modelled by them to ensure that everyone has an open mindset.(A)*

*Leadership teams being brave enough to open it (innovation) up to the students. (B)*

## Teachers

When they were asked about how mindsets were changing, most participants talked about understanding what innovation is. Interviewee D said *demystifying the term* was the most important factor in changing the mindsets of teachers which was leading to a *huge shift in mindset*.

Interviewee A felt that it was not uncommon to see closed or fixed mindsets in school and even admitted having had a fixed mindset in the past but gaining more information and understanding has resulted in his mindset changing over time.

Interviewee E also talked about mindset when discussing skills of innovative teachers.

*Having a growth mindset – so nothing's impossible. So someone who might not have all the answers but somebody who is quite keen to find out.*

*So they'll be innovative but just doing it on their own accord and don't want to see it as an extra thing to do. You'll see people implementing ideas not realizing they are being innovative. So you've got to look at all these mindsets and come up with ways to communicate with them.*

*It's recognizing that it's not just necessary, something that's going to be a burden on them but that being innovative can improve that practice, improve their work load. (B)*

*Teachers were just scared of the word, scared of the word because they thought it meant technology you know our generation didn't grow up with technology and it wasn't something that was natural and it has to be a kind of learned behaviour but as soon as they realised there's more to it, I'd say now they are far more confident. I'd say our teachers are really embracing it and they are enjoying it. So there's been a huge shift in mindset. (F)*

*I think complacency and comfort is a barrier to an innovative mindset.(H)*

*They actually feel that learning this new technique is going to take away from their time. And they don't understand that a little bit of investment goes a long way and that they will they will actually gain more time in the end so changing mindsets definitely - it's about that. (J)*

## **Students**

Interviewee A shared how mindsets in the classroom had changed over time. Students have become more open to it. Other interviewees also discussed this change over time.

*Previously their mindset would have been innovation is technology - just like I did two years ago. And I think most of our staff would have had the same view point. (C)*

*You can't nurture innovation without someone who has a growth mindset. Perseverance, resilience develops the mindset of an innovator. (D)*

*I think when you break it (innovation) down like that to the school community, students, parents and teachers, it suddenly becomes more relatable and manageable and that's where the comfort comes from. So the mindset is changing and people are getting more comfortable. As we make things newer and better it means things are changing. What might be our main aims today could be very, very different next week and it's about having that mindset. It's now expected that we are looking at innovation, even in Foundation Stage - you have to be open to change, and mindset - it's evolving the whole time. (F)*

*Mindset can help students become innovative looking at different solutions to problems, looking at the world a different way but also developing the skills that will enable them to be successful in the future in an ever increasing world where things are changing very, very quickly. (H)*

### **4.2.2 Innovation, policy and leadership**

As seen amongst the reasons for perceptions of innovation changing, the most common was the emphasis by the UAE government on schools and organisations to be innovative as part of their 2021 strategy.

*I think we're quite fortunate we live in a very innovative nation. So they (students) are surrounded by it without necessarily knowing they are. (I)*

Interviewees said that because innovation is high on the agenda of the UAE government, school leaders have begun to consider appointing leaders of innovation who can begin to transform the misconceptions and misunderstandings about innovation and, begin to achieve those ‘small steps’ referred to by interviewee G.

*It’s about Leadership teams being brave enough to open it up to the students (B).*

*Innovation needs to be modelled by senior leadership. (A)*

*When I was given the role of innovation leader I had to go and find out what it meant because I had to tell everybody else. (B)*

*You won’t walk into every classroom and see the exact same thing, people are taking risks and people are doing their own thing in their own room with their students because they know their students, and they know they can. (F)*

### **4.2.3 Innovation and fear**

When asked about teachers in their school and their mindset towards innovation, 3 out of 10 interviewees said that teachers were ‘scared’ of it and have seen it *like the dark cloud that rains on you (D)* or see it as something to fear if they associate it with technology and are not comfortable with technology.

*Teachers were scared of the word innovation because they thought it meant technology. (F)*

Interviewee E said that if you asked teachers what innovation was a number of them would still say technology. Interviewees I and E said it was often seen as something stressful or something that adds to their workload.

*It is important teachers to recognize that it is not something that is going to be a burden on them but that being innovative can improve practice and actually improve their work load. (C)*

*A few see it as an extra thing they feel they don't really need right now and there are a small handful who will take the time to look into how to use innovation, what it means and how they can implement it in their classroom'. (I)*

*Innovation is to some extent about making life simpler. (E)*

Interviewee A discussed the fact that some teachers *inherently don't like change*. This reluctance to change what they (teachers) feel was also referred to by interviewees H and J. They also referred to the fear of trying new things and not being supported by senior leadership so that failure is seen as a learning experience rather than something to be reprimanded for.

Interviewee A, C and H cited how teachers, particularly those who have been in the profession for longer have seen initiatives come and go out of fashion which can make them become sceptical, cynical and reluctant to try something new. Interviewee H also noted that a few teachers see innovation as nothing but an educational 'fad'.

Two of the 10 interviewees said that teachers were positive or open towards innovation.

*On the whole most staff are very keen to be innovative and try new things and share the new things that they try and get involved with new things and very positive toward innovation. (H)*

*People appreciate and respect that it is important. (I)*

*People need to know what it is first before you ask them to promote something. The easiest way to influence them is make them understand that they are all innovators. (C)*

*Demystifying the term by speaking about understanding innovation, recognising the importance of it and why it is necessary, through workshops, was one way teachers' mindsets were changed. The easiest way to influence them (teachers) is to make them understand they are all innovators. (D)*

Interviewee H also talked about plans to devote more time in professional development sessions with teachers in the coming years to *demytify* the concept of innovation, *make it less burdensome and show the benefits of it.*

When asked about differences between groups of teachers and their approach to innovation in learning and teaching, there were different opinions:

*More confident teachers, i.e. teachers with a few years of experience who are comfortable with their teaching practice are more likely to be innovative. (C)*

Three interviewees alluded to the fact that younger teachers were more open to innovation and willing to try new things.

Interviewee F raised the issue that some subject teachers find it a little more difficult to see how they can be innovative

*For example, PE, Music and Drama, as there are fewer models for them to work from unlike in subjects like Science and IT. (F)*

#### **4.2.4 Innovation and teachers' skills**

When asked what skills innovative teachers had, interviewee A said they were good at communicating, they had an open mindset, passion and perseverance, needed to collaborate and be able to adapt in a workplace.

*You'll see that they are always forward thinking and always looking for new ways even if they're successful in one way to try and improve the model for another solution. They won't give up. If something doesn't work they try and find another way around it. It's a continuous process. So an innovator probably is very creative in terms of trying to find solutions. Possibly sometimes too many ideas. (B)*

Interviewee (C) said, innovative teachers tend to be the ones who are inquisitive, do their own reading and research and come up with ideas. He felt that teachers who were



confident and secure with their teaching practice were the ones who felt comfortable to try innovative ideas. For those who are insecure it *just becomes too muddled*.

Interviewee D said innovators were natural networkers, constantly asking ‘what if’, not afraid to challenge the status quo to show that something can be done another way and inspire others.

Interviewee F said she had different strands of innovators amongst her staff – digital innovators, structural organisation innovators and curriculum innovators who had specific skills to innovate in those areas. However, she felt the one skill they all had in common was confidence.

*I would say somebody very positive, growth mindset. So someone who might not have all the answers but somebody who is quite keen to find out. People who are not afraid to give it a go and try something out. People who don't give up and have the confidence and patience to try things out and move on if they don't work. I do think they have got to have the ability to put themselves out there a little bit and to go against the norm and say – we've been doing it this way for years why don't we try this way? (E)*

*Being open-minded and fascinated by the way that students learn, constantly improving and fine-tuning their practice, engaging in debates (on Twitter), sharing information. (G)*

*Key words I would use to describe innovators at our school would be: open-minded, willing to try new things, tenacious, not frightened of failure; open to new ideas and constantly looking for new ideas to try; strong practitioners who are confident in what they do; keen to share what they are doing; positive people who come with a solution to a problem rather than a complaint; resourceful. (H)*

*Teachers who are confident with technology, passionate and enthusiastic and want to know more. Open to ideas, willing to take risks. People with growth-mindset. (I)*

*People who are dedicated, willing to go the extra mile, commit more time. People with a growth-mindset. Those who understand a little bit of investment goes a long way. (J)*

#### **4.2.5 Innovation and students' skills**

*Innovation has perhaps become more signposted than we would have wanted it to with young school learners because of the need to prepare them for inspections. (C)*

Common themes when understanding how students develop into innovators were firstly, that in order to ensure pupils to understand innovation, teachers need to understand it first. Specifically in understanding that innovation is not all about technology. Interviewees saw a need for students' mindsets to be changed and they could do this by clarifying what innovation is and then identify or provide opportunities, including leadership opportunities, which would enable students to become innovators. In order to do this, Interviewee C felt that students needed fundamental knowledge which they would get in school and life experiences which they might get in school or at home.

*Some students will have travelled with their parents a lot, or their parents might work for big companies, or have set up their own company and so an innovative culture is already embedded in them. Some would just have a personal interest in technology or some would just naturally want to problem solve and wants to persevere and be the best of the best. (B)*

Most interviewees felt that students were much more open to innovation than staff. Some of them said students innovate without even knowing they are being innovative, i.e.: they are not constrained by the word.

*Students on the whole are probably much less fearful of failure - they're much keener to take risks than teachers. They really enjoy being given the opportunity, especially in subjects like science, to try and solve problems, try new things and experiment with their learning. (H)*

Interviewee F felt that students understand they are building skills to become innovators.

*So even if they know the importance of developing skills and they know that they need to work on them, I think at the moment their mindset is they don't really feel that it will make a massive difference right now, but they value them for later on when they do graduate and get jobs. (F)*

When it came to differences between groups of students, most interviewees felt that innovation comes more naturally to younger students because they *don't see limits* (F) and are more able to think out of the box than older ones.

*The more knowledge you accrue the narrower, but more focussed, your thinking becomes. (B)*

Interviewees were split between whether girls or boys were more innovative. While some felt that technology, in particular, games, were more geared to boys, girls were more committed and more inclined to come up with innovative ideas to help society.

*They live in this YouTube age - if they want to know something they're quite good at finding a you tube video that gets them what they need (I).*

With all students, including Emirati students, support from home helped them become more inclined towards developing innovative skills.

*Students who have a bit more of a passion and a love for learning outside of school, those who take part in projects outside of school and join clubs. (I)*

#### **4.2.6 Barriers to innovators mindset**

Interviewee B felt that mindset, because of the lack of understating, was the biggest barrier to innovation. Four other interviewees felt that the biggest barrier to innovation was teachers' lack of understanding what innovation really is. An equal number said that lack of confidence or fear of taking risks or even the fear of being criticised.

*I think when people get into their comfort zone they get complacent and they have a very effective way of doing something they can be very resistant to change that for fear of it being worse than it already is.(H)*

One referred to the difficulty of getting buy-in from staff. This was less so where leaders modelled innovation or created a culture where risk-taking was encouraged rather than a blame culture. Mindset was also a key barrier according to four interviewees

*You can't nurture innovation with someone who hasn't got a growth mindset. In order to succeed, you have to do things a bit differently in to stay current. (D)*

The most common barrier to innovation was linked to the pressures of the curriculum, which had an impact on time. The question one interviewee asked himself was:

*Does the student leave school as an innovator or one who achieves well in examinations? (B)*

They said lack of time was the biggest factor, particularly at secondary school level where exam results took precedence. Interviewee E talked about some changes that have been recently made in the English National Curriculum that now include topics that lend themselves better to innovation.

*I think the big barriers are time. Teachers are busy, the workload is high and finding the time to find out, research, get their own CPD around innovation because it's new to most teachers. They don't have training or knowledge of what innovation is so how they can implement it in the classroom? I say time is a big factor and lack of knowledge and training. (I)*

*I'm sure most teachers would like to be innovative and try new things but there needs to be a bit of a time investment and that can sometimes be difficult. I think the complacency and time pressure - not having the luxury of time to experiment. I think maybe in terms of a culture of a school if the school is very anti failure or there's a big risk there or there's a blame culture then innovation won't really happen. (H)*

*Some people are not as keen on other people's opinions, they want to do it a certain way. And that could be a weakness for some innovators. Some don't want other people to carry on their research and they want things in a particular way and can be very secluded on their own. (B)*

Other factors that worked as barriers to innovation were lack of funds for technology, high turnover of teachers or too many new ideas at any one time.

From a student's point of view, most felt that there were fewer barriers as students were generally more open to innovation and had growth mindsets. The barriers mentioned here were with students who don't have support from the family at home or lack of motivation to dedicate time after school, particularly with extracurricular projects.

### **4.3 Synthesis of results**

Most of the interviewee's definitions of innovation were closely linked to theoretical definitions cited in this paper using the words new, better and improved in their definition and can be incremental. Other links with theories were that teachers innovate without knowing they are. Hargreaves (2003) says that teachers adjust materials or ways of organising lessons to help pupils learn and these improvisations are a form of innovation an Kirkland and Sutch (2009) views of second order barriers such as perception.

#### **4.3.1 Innovative skills – a comparison**

Innovative skills of teachers and students that were identified by the interviewees were grouped together for analysis. Terminology was sometimes different, for example, curiosity for students and inquisitiveness for teachers, creative for students and coming up with ideas for teachers, but for the purposes of analysis, they were grouped under the skills in the figure below.

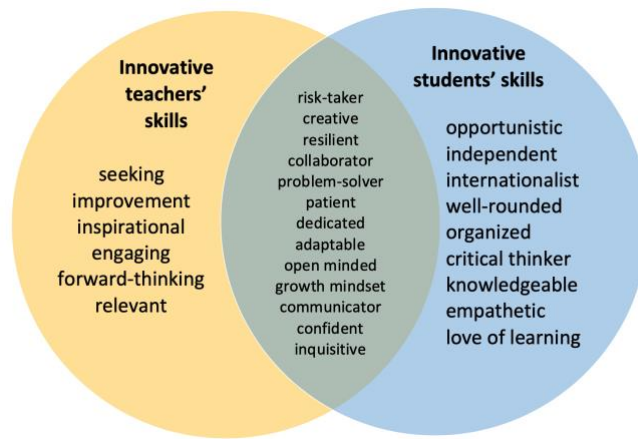


FIGURE 7: Skills commonly or uniquely attributed to innovative teachers and students by interviewees.

Although there was considerable overlap, and in many cases, were equally attributed to innovative students and teachers.

There were some skills attributed just to students that could be seen as equally important for teachers or leaders, particularly skills such as being **opportunistic**, **thinking critically** or being **empathetic**. The first two were in the top skills held by innovative business leaders in figure 1. Couros (2017) maintains that an empathetic teacher understands the student’s point of view.

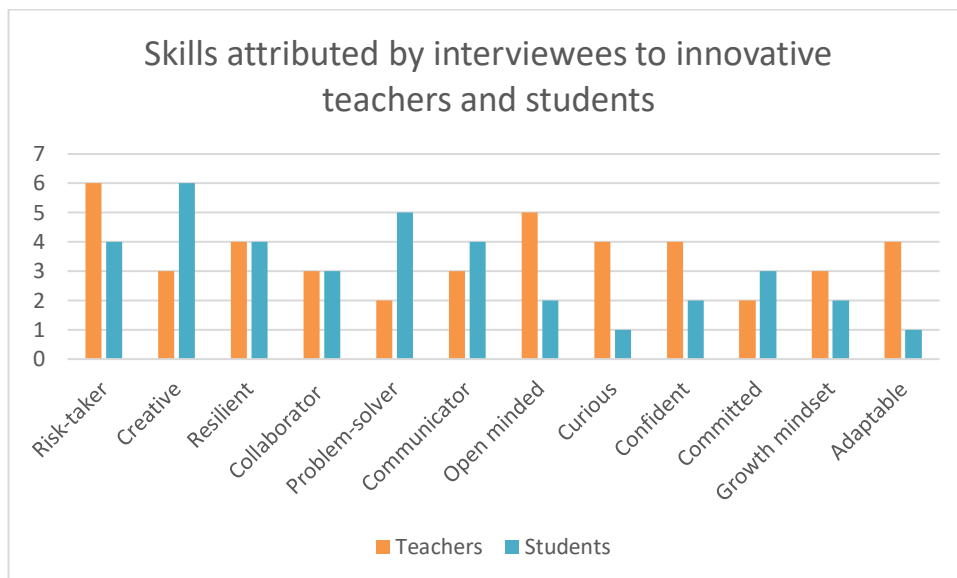


FIGURE 8: Comparison between skills commonly attributed to innovative teachers and students by interviewees.

Larger differences were seen with skills such as **creativity** and **problem-solvers** which were attributed more to students and being **open-minded, curious** and **adaptable**, that were attributed more to teachers. It is possible that these differences were due to the different relationships and leaders' perceptions and expectations differing slightly from both groups, peers and students.

The top two skills, commonly attributed to students and teachers, matched the top two 'critical skills for the most innovative jobs' Avvisati et al (2013). For example, **coming with new ideas and skills** was common to both students and teachers, grouped under creative and problem solver and the **willingness to question ideas** are listed as risk takers.

Further analysis of the skills commonly attributed to teachers and students, identified strong similarities in skills such as being **resilient** and **collaborating**. Other skills like **communicating, commitment, confidence** and having a **growth mindset** were almost equally attributed to both.

#### **4.3.2 Misconceptions about innovation**

The most common misconception about innovation, held by the interviewees and teachers (and students) in their school was that innovation was intrinsically related to technology and most previously held these misconceptions themselves. All participants agreed that the importance of ensuring that innovation was understood by teachers and inculcating skills amongst students were crucial in order to enable an innovator's mindset.

An unexpected but common theme throughout the interviews that came up, was teachers' fear of the word. The words 'scared, fear, fearful and frightened' appeared 13 times in a search in the interview transcripts. The fear came either from not being comfortable with technology or from not being confident that they could take risks without blame. This relates closely to leaders developing an innovative environment or culture where risks can be taken.

According to Vincent-Lancrin et al (2017) 70% of graduates employed in the education sector believe their organisations to be innovative which is in line with the economy average of 69% although this was more applicable in higher education as opposed to primary and secondary education. However, when it comes to adopting innovation new knowledge or methods, education is below average at 38% compares to 41% in the economy (Vincent-Lancrin et al 2017). Interviewees gave the impression that innovation is something new in the education sector. It is possible that this is due to the perception of innovation being linked to 'whizzy', 'high tech' ideas as a majority of interviewees suggest that they themselves had and that most teachers still think or the general misunderstanding of what innovation really is that is also evident from the interviews.



## 5 DISCUSSION

### 5.1 Discussion of results

An interesting observation during this interview process was that, most participants thought only of the positive attributes of innovative teachers and students. Only interviewee B raised the question about the negative impact of innovators sometimes liking to work on their own or driving too many innovative ideas at the same time. This was a noteworthy difference of opinion and a valid one. Innovators sometimes do not secure buy-in for their innovative ideas if they are not well thought out. So when interviewees talked about teachers who were sceptical about innovation, it could be that their experience of innovation or innovators had not been positive. This leads back to discussions in this thesis about developing holistic innovators who possess soft skills (World Economic Forum 2018) too.

Social media trends, although not always scientific, could be one way of dispelling myths about innovation, as they open up debate. Social and collaborative aspects of learning through informal social networks such as personal learning networks and including social media platforms such as LinkedIn and Twitter which today, are increasingly common amongst educators. Such platforms provide what Kirkland and Sutch (2009) refer to as a supportive atmosphere for innovation which encourages people to try new ideas (Kirkland and Sutch 2009).

The most common misconception about innovation previously held by the interviewees, and still held by teachers and students in some schools, was that innovation was intrinsically related to technology. This is not unusual in that a number of theories, studies and policies about innovation are linked to technology. It is worth thinking how schools can shift away from this. While the majority of those interviewed were leaders from IT, Design or science backgrounds, schools have now begun to appoint leaders who are open minded and forward-thinking and not necessarily in those fields. One interviewee was from a geography background another cited an English teacher as being the most innovative in his school. This is perhaps a good way of ensuring that technology and innovation are not seen to be inextricably linked.

An unexpected but common theme throughout the interviews, was teachers' fear of the word innovation. The words 'scared, fear, fearful and frightened' appeared 13 times in a search in the interview transcripts. The fear came either from not being comfortable with technology or from not being confident that they could take risks without blame. This is also true for students in classrooms not feeling confident to take risks. To remove these barriers, leaders need to create environments where risk-taking is encouraged however, there are often financial, social and time constraints to consider and therefore risks need to be managed well (Graham-Leviss 2016).

Changing mindsets and shifts in mindsets were also commonly talked about. Can cultivating growth mindsets in very young minds today, ensure an innovative future? Do parents and communities also have a role to play in cultivating such a mindset?

There are many scientific and technological developments that exist today that were not predicted. Shifts in the way the world operates are constantly happening and boundaries are constantly becoming blurred. As educators, we should focus on developing holistic learner who is prepared for life in the 21<sup>st</sup> century and beyond – whatever that might hold in store and a growth mindset is one way to prepare for that unpredictable future.

## **5.2 Contribution to previous research**

This thesis aims to bridge gaps in studies about a) innovation in schools and b) innovation studies that are not linked to technology and c) a seamless study of innovative skills from early years in school, to managing organisations. The study seeks to offer practical ways that schools can enable innovation, developed from a combination of theory and real life accounts of leaders of innovation in private schools in Dubai.

A search on any library database about innovation will bring up books and articles about innovation in the work place. Most will link these to technological innovations. Articles and books that discuss innovation in schools are less common. Measuring innovation in schools is relatively new, too (OECD 2009). It is little wonder that most interviewees said that innovation in schools is so misunderstood.

This study includes theory from a range of studies about innovation skills in organisations and schools, combining them in order to develop a continuous theme that runs throughout life. Results from the empirical study include observations of innovation skills seen in students from Foundation Stage (kindergarten) to high school. These results are compared with skills that Freeman et al (2017) suggested in their study of innovative K-12 schools, skills that graduates (five years into their jobs) felt were necessary for innovation (Avvisati et al 2013) and a study based on surveys of 5000 leaders in a range of industries (Graham-Leviss) 2016 to produce 6 Cs – all inextricably linked, not to technology, but to mindset. For innovation is about growth and without a growth mindset, these skills are not likely to result in innovation.

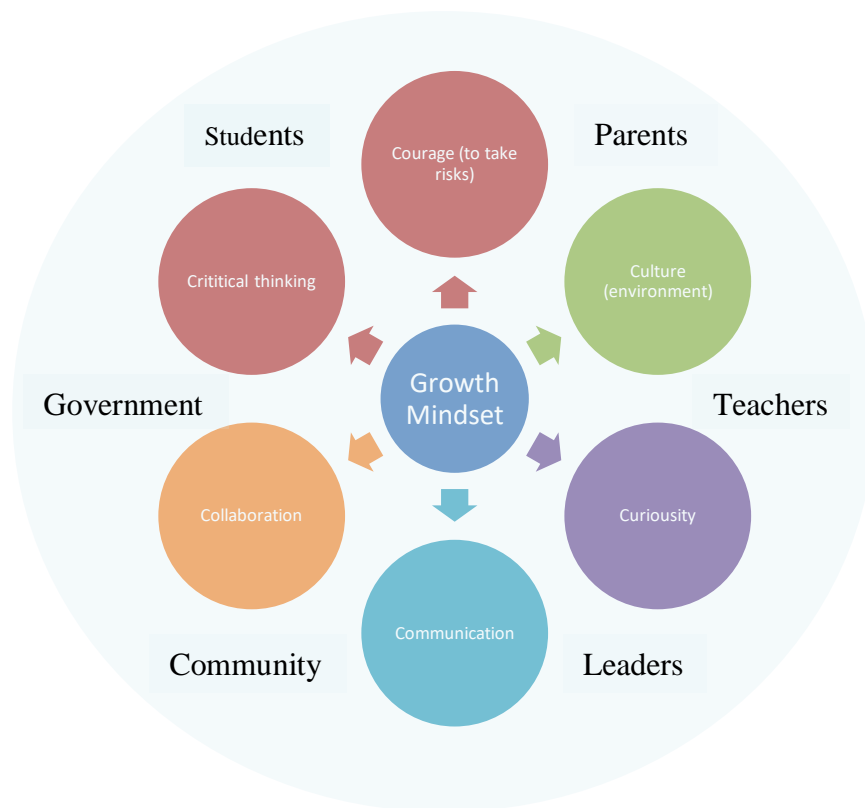


FIGURE 9: Enabling innovation through mindset

In order to develop that innovative mindset, skills such as curiosity, critical thinking, courage (risk-taking), communication and collaboration are essential, as is a culture or environment where innovation can flourish and it is the entire school community that needs to work together to do so.

### **5.3 Practical conclusions**

Perceptions about innovation collected during the interviews and from data about private schools in Dubai (KHDA 2018), are evidence that innovation is not yet systematic in all schools. Taking into consideration the theory studied and the information gathered during the interviews, practical conclusions have been gathered for schools wanting to further promote innovation.

#### **5.3.1 Understanding innovation**

One of the biggest barriers of innovation seen in schools, according to the interviewees is that it is misunderstood. It is evident that this misunderstanding is at all levels: policy makers (OECD 2016); leaders (as some of the participants admitted); teachers who misunderstood or even feared it and students because teachers who were not clear or able to confidently pass on the understanding.

Interviewees felt support from home was necessary to encourage a commitment towards innovation. Interviewee B felt some students naturally inherit an innovative culture from their parents. According to the 12 measures of innovation (Vincent-Lancrin et al 2017), parental involvement was one of the areas where least changes were seen. Sutch et al (2008) also discuss teachers' reluctance to engage in innovation because of the risk of criticism from parents. Parents often pay substantial fees to send their children to better schools and therefore expect to have a justification of why money is invested in tools such as technology (figure 4) or other programs that schools invest in to promote innovation.

Therefore, policies at a national and school level need to ensure that parents and the community share the same understanding. Other considerations for policy-makers are that although PISA results are being used to shape policies about innovation in education, some (Breakspear 2014, Sahlberg 2018) warn that they need to consider other factors that PISA does not take into consideration such as social, emotional and

interpersonal skills. So it is crucial that this is a shared understanding amongst *all* stakeholders, of what innovation really means.

Most interviewees said that their role was what made them seek out a better understanding of what innovation really meant. Appointing leaders of innovation is therefore one way of engaging in deeper understanding about innovation. Leaders of innovation interviewed are reading and researching the true meaning of innovation and then sharing it with other staff and students, demystifying it, changing perceptions and causing shifts in mindsets as they do.

### **5.3.2 Removing barriers to innovation**

From a leadership perspective, **innovation needs to be modelled by leaders at all levels** so that staff feel enabled to innovate and take risks. It is leaders who **create an environment or culture** that allows innovative ideas to take shape without the fear of failing (Kirkland and Sutch 2009). Of course failure does have its costs so once again it needs a holistic approach to decide whether a risk can be taken. In other words, they need to be managed well (Graham-Leviss 2016). The fear of not being supported by senior staff was referred to by four out of ten interviewees. On the other hand, interviewee B also talked about how leaders at his school were brave enough to open up to the students for innovative ideas. In addition, the message about innovation needs to go out to parents and the whole school community so that students get **support from home** which is just as important in securing commitment and dedication and in developing an innovator's mindset.

As Baumgartner (2018) maintains, innovative leaders do not necessarily need to have innovative ideas, but they need to enable them. Thus leaders need to recognise and appreciate innovative ideas and actions, no matter how small, if they want to foster innovation in their schools.

Sharing ideas and engaging in discussions (Hargreaves 2003), whether face to face or on social media helps to **spread innovative ideas** and foster a collaborative culture in which innovation can grow. Besides sharing innovative ideas, this will also help dispel myths about innovation. Whilst private schools in Dubai are competitive, a number of them have

a social media presence and have begun to initiate or take part in collaborative ventures between schools. Sharing innovative ideas starts at the top as KHDA celebrate and share innovative ideas from private schools in Dubai on their twitter feeds @KHDA and on Instagram at KHDADubai.

Governments need to ensure that innovation is embedded in **initial teacher training**, across subjects and teaching ranges so that innovation is not just seen as a domain for those who teach STEM subjects. Although countries like New Zealand, Finland and Ireland are reforming their teacher training to include digital technology (Freeman et al 2017), it is equally important that enough focus is given to other ways of promoting innovation such as the development of soft skills (World Economic Forum 2018) so that teachers too, develop skills that enable them to innovate.

An innovative mindset can enable teachers to accept that that **innovation is a part of teaching and learning and not something that is in addition to it**. This is crucial to getting buy-in from teaching staff. Interviewees said that it is often when teachers realise or see for themselves that investing time in developing innovative ideas or tools can result in effective use of their time overall, there is a shift in mindset. So it may be that innovative ideas take time and patience for teachers to acknowledge that it is not an additional burden but instead something that is part of everyday teaching and learning. As Hargreaves (2003) and some of the interviewees said, teachers often innovate in their practice without even knowing that they do. Once again, it goes back to school leaders to recognise these innovative ideas and allow time for reflection on innovation that already exists in their schools.

**Embedding innovative skills into the curriculum, including in preparation for examinations** so that it is seamless and not perceived as something that takes away time from curriculum, is an important aspect for schools to encourage as exams and curriculum constraints are perceived as a barrier. Interviewee B asked the question: *Does the student leave school as an innovator or one who achieves well in examinations?* Can they leave with both? Do they have to be separate? Can they find innovative ways to prepare or revise for exams? Giving students the opportunity to design and explain their ideas are the less developed points 8, 9 and 11 of the 12 measures of innovation (Vincent-Lancrin et al 2017). Would explaining designing and explaining ideas contribute to students achieving well or even better in exams?

Having an understanding that **innovation isn't only about technology although technology can be a tool that can enable it** would help to eradicate the fear of innovation amongst teachers who are not comfortable with using technology to teach. This is still a barrier for teachers who have been in the profession a long time and who may have a lot to give but struggle to cope with technology. Developing a growth mindset and fostering a positive culture of learning within a school, can help overcome this. What school leaders and teachers need to foster is the idea that innovation without technology perhaps in art or physical education is just as important.

### 5.3.3 Enabling innovation through mindset

This thesis began with studies that identified skills of innovative leaders in organisations and interviewed leaders of innovation about innovative skills in schools. Throughout, there appears to be a seamless thread of core skills that are characteristics of innovators.

Modelling and **developing 21<sup>st</sup> century skills** in schools will ensure that students are well equipped to be curious, think critically, be courageous, communicate, work collaboratively in a positive learning environment or school culture, as future leaders and citizens of an unpredictable world. Because of its unpredictability, cultivating a **growth mindset** will mean that students are prepared to combat any future challenges, not just the technological ones.

For innovation to become systematic in schools, it is time to acknowledge that innovation isn't a 'fad' or an addition to a heavy workload, it isn't always necessarily about technology, robots or computers, it's not always restricted to STEM subjects - it is simply a (growth) **mindset** that allows new or improved ideas and solutions, no matter how small, to make a positive difference in outcomes for members of the school community.

## REFERENCES

Arksey, H. & Knight, P 1999. *Interviewing for Social Scientists: An Introductory Resource with Examples*. 1st edition. SAGE Publications Ltd.

Avvisati, F., Jacotin, G. & Vincent-Lancrin, S. 2013. Educating Higher Education Students for Innovative Economies: What International Data Tells Us. *Tuning Journal for Higher Education* ISSN: 2340-8170. Issue No. 1, November 2013, 223-240.

Baker, S.E. & Edwards, R. 2012. How many qualitative interviews is enough? Expert voices and early career reflections on sampling and cases in qualitative research. National Centre for Research Methods Review Paper. Economic and Social Research Council.

Baumgartner, J. 2018. Enterprise Innovation. Read on 11.11.2018.

<http://www.innovationmanagement.se/imtool-articles/what-is-innovative-leadership/>

Billimoria, J. 2017. Is STEM education all it's cracked up to be? *World Economic Forum*. Read on 20.04.2018

<https://www.weforum.org/agenda/2017/05/is-stem-education-all-it-s-cracked-up-to-be/>

Birmingham, P. & Wilkinson, D. 2003. *Using Research Instruments : A Guide for Researchers*. 1<sup>st</sup> Edition. Routledge Study Guides. London: Routledge.

Blandford, A. 2013. Semi-Structured qualitative studies. *The Encyclopedia of Human-Computer Interaction* 2<sup>nd</sup> edition. Aarhus, Denmark: Interaction Design Foundation.

Braun, V. & Clarke, V. 2006. Using thematic analysis in psychology. *Tuning Journal for Higher Education* ISSN: 2340-8170. Issue No. 1, November 2013, 223-240.

Breakspear, S. 2014. How does PISA shape education policy making? Why how we measure learning determines what counts in education, Centre for Strategic Education, Seminar Series Paper No. 240.

Colvin, G. 2017. The World's 50 Greatest Leaders. *Fortune*. Read on 20.04.2018  
<http://fortune.com/2017/03/23/worlds-50-greatest-leaders-intro/>

Couros, G. 2015. The innovator's mindset. Dave Burgess Consulting Inc. San Diego.

Crosscombe, N. 2018. Innovation. *Brock Education Journal*, 27(2).

Doss, H. 2013. Innovation: Five Keys to Educating the Next Generation of Leaders, Entrepreneurs, *Forbes* March 19. Forbes Media LLC.

Dweck, C. 2006. *Mindset*. Random House Publishing Group. United Kingdom.

Dweck, C. 2016. What Having a "Growth Mindset" Actually Means. *Harvard Business Review*, January 13, 2016.

Export.gov 2018. United Arab Emirates – Education. Read on 03.03.2018.  
<https://www.export.gov/article?id=United-Arab-Emirates-Education>



Falch, T. & Mang, C. 2015. Innovations in education for better skills and higher employability. European Expert Network on Economics of Education (EENEE) Report No. 23.

Finnish National Agency for Education. 2014. National Core Curriculum for Basic Education in 2014.

Freeman, A., Adams Becker, S., Cummins, M., Davis, A., & Hall Giesinger, C. 2017. NMC/CoSN Horizon Report: 2017 K–12 Edition. Austin, Texas: The New Media Consortium.

Galletta, A. 2012. Mastering all the Semi-Structured Interview and Beyond, NYU Press

Global Innovation Index. 2018. Report Analysis Read on 03.03.2018.  
<https://www.globalinnovationindex.org/analysis-indicator>

Graham-Leviss, K. December 20, 2016. The 5 Skills That Innovative Leaders Have in Common. Harvard Business Review.

Greany, T. 2016. Innovation is possible, it's just not easy: improvement, innovation and legitimacy in England's autonomous and accountable school system. London Centre for Leadership in Learning. London: UCL Institute of Education.

Hargreaves, A. 1998. The Emotional Practice of Teaching, Teaching and Teacher Education. v14 n8 p835-54 Nov 1998, ERIC.

Hargreaves, D.H. 2003. Working laterally: how innovation networks make an education epidemic. DFES Publications. Nottingham: UK.

Harvard Business Review. 2017. The Best Performing CEOs in the world 2017. November-December 2017 Issue. Read on 03.03.2018.  
<https://hbr.org/2017/11/the-best-performing-ceos-in-the-world-2017>

Hitchcock, G. & Hughes, D. 1995. Research and the Teacher : A Qualitative Introduction to School-based Research. London: Routledge.

Jamrisko, M., & Lu, W. (2018). The U.S. Drops Out of the Top 10 in Innovation Ranking. Bloomberg.com. Read on 20.04.2018  
<https://www.bloomberg.com/news/articles/2018-01-22/south-korea-tops-global-innovation-ranking-again-as-u-s-falls>

Burke Johnson, R. 1997. Examining the Validity Structure of Qualitative Research. Education; Winter 1997; 118, 2; Research Library.

KHDA. 2017. KNOWLEDGE AND HUMAN DEVELOPMENT AUTHORITY. The Future of Education: A focus on schools in Dubai.

KHDA. 2018. KNOWLEDGE AND HUMAN DEVELOPMENT AUTHORITY. Dubai Private Schools: A Decade of Growth. Key Findings 2008 – 2018.

Kirkland, K.& Sutch, D. 2009. Overcoming the barriers to educational innovation: A literature review. NFER. National Foundation for Educational Research.

Lubienski, C. 2009. Do quasi-markets foster innovation in education?: A comparative perspective. Read 04.12.2018 <http://econpapers.repec.org/paper/oeceduaab/25-en.htm>

Ministry of Education, Singapore. Student-Centric and Values-Driven Holistic Education poster. Read on 04.04.2018  
<https://www.moe.gov.sg/docs/default-source/document/education/files/student-centric-values-driven-poster.pdf>

OECD-Eurostat. 2005. Oslo Manual. Guidelines for Collecting and Interpreting Innovation Data. 3rd Edition. Paris: OECD Publishing.

OECD. 2009. Measuring innovation in education and training, OECD discussion paper. Paris: OECD Publishing.

OECD. 2010. Strong Performers and Successful Reformers in Education: Lessons from PISA for the United States. Paris: OECD Publishing.

OECD. 2011. Education at a Glance 2011. OECD Indicators. Paris: OECD Publishing.

OECD. 2013. Innovative Learning Environments. Educational Research and Innovation. Paris: OECD Publishing.

OECD. 2016. Innovating Education and Educating for Innovation: The Power of Digital Technologies and Skills. Paris: OECD Publishing.

Schleicher, A. OECD. 2018. The Case for 21<sup>st</sup> Century Education, Paris: OECD Publishing.

Online Etymology Dictionary. Douglas Harper. 2001 – 2018.  
<https://www.etymonline.com/search?q=mindset>

Owen, J. 2017. The race for Pisa Test points is obscuring the key to successful education, Special Report: innovation in Education, Financial Times  
<https://www.ft.com/content/157bc3d6-b59f-11e7-8007-554f9eaa90ba>

Root-Bernstein, M. and R. 2011. Imagine That! From STEM to STEAM to STREAM: wRiting as an Essential Component of Science Education, Psychology Today. Read on 03.05.2018

<https://www.psychologytoday.com/us/blog/imagine/201103/stem-steam-stream-writing-essential-component-science-education>

Sahlberg, P. 2018. Finnish Leadership: Four Big Inexpensive Ideas to Transform Education. Corwin. Sage Publications.

Serdyukov, P. 2017. Innovation in education: what works, what doesn't and what to do about it? Journal of Research in Innovative Teaching & Learning Vol. 10 No. 1, 201 pp. 4-33 Emerald Publishing Limited.

Silander, P. 2015. Phenomenal Education, Phenomenon Based Learning Rubric  
Read on 03.05.2018  
<http://www.phenomenaleducation.info/phenomenon-based-learning.html>

Siliconrepublic. 2017. What's driving STEM Education? Read on 20.04.2018  
<https://www.siliconrepublic.com/careers/stem-education-emerging-trends>

Spiller, P. (2017) BBC News, Finland, Could subjects soon be a thing of the past in Finland? Available at: <http://www.bbc.com/news/world-europe-39889523>

Sutch, D., Rudd, T., & Facer, K. 2008. Promoting Transformative Innovation. Futurelab. NFER. National Foundation for Educational Research.

QS World University Rankings . 2018. Read on 03.03.2018.  
<http://www.qs.com/the-strongest-higher-education-systems-by-country-overview/>

TeachThought. 2018. 30 Of The Most Popular Trends in Education. Read on 03.03.2018.  
<https://www.teachthought.com/the-future-of-learning/most-popular-trends-in-education/>

The STEMIE coalition. 2018. Read on 03.05.2018  
<http://www.stemie.org/the-stemie-coalition/>

Truckman, B.W., & Harper B. E. 2012. Conducting Educational Research. Rowman & Littlefield Publishers. 6<sup>th</sup> edition.

UAE Vision 2021. 2018. UAE National Agenda 2021. Read on 03.03.2018.  
<https://www.vision2021.ae/en/national-agenda-2021>

United Arab Emirates School Inspection Framework. 2015 – 2016. Read on 03.03.2018.  
<https://services.moe.gov.ae/MoeDocs/Docs/School%20Inspection%20Framework-En%202015-2016.pdf>

UAE Government. 2015. Science, Technology and Innovation Policy. Read on 03.03.2018.  
<https://government.ae/-/media/Science-Technology-and-Innovation-Policy.ashx>

UAE National Innovation Strategy. 2015. Prime Minister's Office. UAE Ministry of Cabinet Affairs 2015.

Valanne, E. Dr., Dhaheri, R., Kylmalahti, R. & Sandholm-Ramgell, H. 2017. Phenomenon Based Learning Implemented in Abu Dhabi School Model International Journal of Humanities and Social Sciences, Vol.9. No.3, pp.1-17.

Van Holm, E.J. 2015. Makerspaces and Contributions to Entrepreneurship, Elsevier Ltd. ScienceDirect. Procedia Social and Behavioural Sciences. 195. 24-31.

Vincent-Lacrin, S.G., Jacotin, J. Urgel, S. Kar and C. Gonzalez-Sancho (2017), Measuring Innovation in Education: A Journey to the Future, OECD Publishing, Paris.

World Economic Forum. The future of education, according to experts at Davos. Read on 20.04.2018. <https://www.weforum.org/agenda/2018/01/top-quotes-from-davos-on-the-future-of-education/>

XBInsight. 2017. The Skills of Innovative Leaders Read on 03.03.2018  
<https://www.xbinsight.com/leadership-development-process/innovative-leadership/>

## APPENDIX

### Interview Questions

What is innovation?

What is your mind-set towards innovation?

If I had asked you this question 5 years ago, would your answer have been different?

What is the mind-set of learners towards innovation?

Are there observable differences in different groups of students?

What do you think are the causes for these differences?

Are mind-sets changing?

What is causing mind-sets to change?

Has your role influenced the mind-set of teachers/ learners?

What is the mind-set of teachers towards innovation?

Are there differences amongst different groups of teachers?

Can you identify innovators amongst your teachers?

Are there common skills you could attribute to them? Behaviours?

What are the barriers to an innovator's mindset?