

RESEARCH ARTICLE:

Graduate Employability through Industry-Oriented, Problem-Based Learning: A Case Study

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Abstract

Higher education is coming under increasing pressure. Central to this is the global growth in disruptive technologies, accelerated by responses to the recent global pandemic. The pressure on how education is taught is immense, especially as concurrently there is a change in the career objectives of graduates, and the skill sets required by employers, with transferability high on the wish list. This paper provides a discussion and case study of how one institution has taken up this challenge through the development of a new educational model, named Syntegrative Education. It highlights how Syntegrative Education, through symbiotic partnerships with industry, creates an industry-oriented ecosystem, embracing learning, research, innovation, entrepreneurship and social interaction, matching the learning experience with dynamic AI oriented industry employability demands, ensuring all graduates are future ready with entrepreneurial graduate attributes. The case study focuses specifically on the innovative change to delivery and assessment. Through the industry partnerships, students are introduced to research and inquiry-based learning through real-life problems, proposed and initiated by industry. Industry also works as mentors for the students alongside academics. The article concludes by highlighting the potential for other institutions who wish to follow the same route of curriculum development.

Keywords: syntegrative education; industry 4.0; industry partnerships; entrepreneurial education

Introduction

Higher education is coming under increasing pressure from a number of different sources, including lack of adequate funding, increased competition globally, advances in technology, and questions about the worth of a university education in today's world. Changes in technology is a particularly acute problem, as the world tackles the disruption created as a result of Industry 4.0 (Schwab, 2016). Central to this is the growth in Artificial Intelligence (AI) and Virtual Reality/Augmented Reality (VR/AR), which could revolutionize learning design, delivery, and assessment. The potential for change to how education has traditionally been taught is significant, particularly to ensure that education, and especially degrees, offer value based on employability potential (Tomlinson, 2008), and that degree programmes are future ready for Industry 4.0. At the same time, there is a change in the career objectives of graduates, and employers no longer wanting standardized graduates. Employability, specifically in the technical age, is high on graduates wish lists, with skills such as communication, teamwork, problem solving, initiative and enterprise, planning and organising, self-management, and learning and technology considered to be as important as technical skills (Huq and Gilbert, 2013).

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Using a case study, this paper looks at the introduction of entrepreneurial education through the creation of an Entrepreneurial College within a university within China, starting with a discussion of a new and innovative education model the university has developed that is industry and disciplinary focused, known as Syntegrative Education (SE). Designed as a new education, university, and campus concept (Taylor, 2012), this ties in with the university's ambition to be a pioneering promoter and builder of an Innovation and Entrepreneur Community, as well as an ambition to inform and contribute to the enhancement of higher education provision in China.

This paper starts with a brief discussion on entrepreneurial education, before continuing with a discussion on the Syntegrative Education philosophy and its influences. It goes on to discuss in detail the creation of a new undergraduate research, scholarship, and creative inquiry (URSCI) curriculum, which highlights the relationship between students, industry, and society, creating an ecosystem that embraces learning, research, innovation, entrepreneurship, and social interaction. It explains how the Entrepreneur College matches students learning outcomes with dynamic AI oriented industry employability demands. It also explains how symbiotic partnerships with industry allow an innovative industry classroom through changes to assessments, curriculum design, programme delivery, business incubation, and research and innovative solution development at undergraduate level.

Entrepreneurial Education

The growth of industry 4.0 and disruptive technologies has accelerated the demand for entrepreneurial education (Pagano, Petrucci and Bocconcelli, 2018). Entrepreneurship in education is not new, with universities often adopting initiatives such as an entrepreneurial approach to reflect how society is changing. Partly as a result, the World Economic Forum (2020) introduced the Education 4.0 initiative, highlighting the need to develop and promote interactive teaching that can develop the critical thinking skills needed for future and current industries. As a result, many institutions are introducing what they term entrepreneurial education, though as Diehl, Lindgren and Leffler (2015) highlight, entrepreneurial education is not exactly new. There is some debate as to what constitutes entrepreneurial education, with Lackeus (2015) suggesting two possibilities; innovative and student-centred learning and teaching characterized by creativity and meaning-making to create an entrepreneurial mindset (enterprise education), or education that provides the basis and scope to enable students to set up a business venture (entrepreneurship education). Erkkila (2000) proposes the term "entrepreneurial education" to bring together both these concepts.

Fernandez-Nogueira *et al.* (2018) highlight eight good practices that are necessary when connected to entrepreneurship, and by default entrepreneurial education; innovation/creativity, transferability, transversality, sustainability, effectiveness/usefulness, efficiency, impact, and evaluation/monitoring. Moberg, Stenberg and Vestergaard (2012) suggest that entrepreneurial education should be seen as the methods, activity and content to develop the knowledge, skills and attitudes that affect the willingness and ability to perform the entrepreneurial job of value creation. Lackeus (2015) claims that the main goal of entrepreneurial education is to install entrepreneurial competencies in students. Lackeus (2015) continues by highlighting the innovative nature of entrepreneurial education, suggesting it is student-centred, creative and has meaning-making, which would be in line with the competencies highlighted by Moberg *et al.* (2012). Similarly, Neck, Greene and Brush (2014) suggest that entrepreneurial education is all-inclusive, is applicable at multiple layers, and involves continual practice and upskilling. Welsh (2014) goes further in suggesting that

entrepreneurial education is a way to teach the 21st-century workforce, by building in flexibility, resilience, and transferable skills in any area of study or discipline, thereby teaching students to be creative, innovative and entrepreneurial.

This would certainly seem to be the way that the Chinese government is going, with entrepreneurship education one of the fastest-growing subject areas in the Chinese context. The Chinese government has prioritized the development of entrepreneurial education and perceived entrepreneurship as new value creation and innovation-driven strategies for disruption and transformation (Dou *et al.*, 2019). Examples include the need for all Chinese universities and colleges to provide courses in entrepreneurial education (Liu, Zhang and Feng, 2016), as well as an increase in online courses, entrepreneurship textbooks, and calls for innovation in existing teaching methods (Xue, Lu and Li, 2016), changes which have been accelerated by the pandemic.

Arguably the most well-known initiative is the China's State Council's May 2015 announcement called 'Made in China 2025', to improve its manufacturing industry, which has now been extended to 2049. The goal of this initiative is to transform China into a leading manufacturing power and draws direct inspiration from Germany's 'Industry 4.0' plan, which was first discussed in 2011 and later adopted in 2013. The announcement had a number of different elements to it, to be achieved during the 13th five-year plan between 2016 and 2020. This included developing applied technical universities or vocational colleges, again influenced by models studied in European educational systems found in Germany, the Netherlands, Switzerland, Austria and Finland. In addition, existing colleges that offered three-year diplomas were also encouraged to take up the initiative, especially to create greater collaboration between local government, industry and higher education, with the intention to create more highly skilled graduates in identified areas.

It is perhaps too soon to determine how successful these government initiatives have been within China, but a study by Dou *et al.* (2019) at a large public university in China that has embraced entrepreneurial education suggests that is helpful in establishing entrepreneurial attitudes within students, especially when combined with social environmental resources.

The Case Study

Partly in response to national initiatives to develop entrepreneurial education, the university which this paper is based on developed a new education model for the digital age, named Syntegrative Education (Malik, 2019), or SE. SE is developed from a business concept of syntegegration (Malik, 2019), the joining together of synergy and integration, to describe the importance and process of bringing together a large number of people to join in a highly harmonious symphony in order to interconnect a range and variety of knowledge, creating something as a rule that is totally new and important. The university has taken this concept and applied it to education with a focus on effective communication, especially between universities, industry, and government.

There have been a number of influences in the development of the SE model, including the high-impact practices (HIP) movement within the USA, and the German vocational university model, as well as the influences of entrepreneurial education already highlighted. The HIP movement originates from work such as that by Astin (1999), who suggests that active student involvement in their studies had positive results with regard to achievement and attainment. Kuh (2012) takes this further, highlighting that research at US institutions shows that students get more out of their higher education experience when they engage in what he termed high-impact practices. HIPs can take different forms, depending on learner

characteristics, institutional priorities and contexts (Kuh, O-Donnell and Reed, 2013), but include such activities as first-year seminars, common intellectual experiences, learning communities, collaborative assignments and projects, undergraduate research, community-based learning, internships, and capstone projects. Whilst many of these are already normal practice outside of the US context that HIPs were developed in, SE has taken each of these and more and integrated them wholly into the curriculum across all four years.

When developing the SE model, time was spent studying the German vocational training system for the way that it combines classroom learning with business or industry based practice. Named the dual system, its key characteristic is the way that businesses and vocational schools cooperate, as well as the cooperation between the individual German federal states responsible for schools, and the national government for the training within business. Current challenges for the system include ensuring that the curriculum stays relevant for the disruption bought by new technologies, changing labour markets, and providing skills training for more entrepreneurial opportunities (Du and Liu, 2020).

Syntegrative Education

The relationship between universities, industry and government is not new. Since the mid-1990s, Etzkowitz and Leydesdorff (2000) have developed their triple helix model which builds the entrepreneurial university model around a partnership between education, industry, and government, with a common goal of technological innovation. Leydesdorff (2012) suggests that the overlay of communications between industrial, academic, and government discourses can develop new options and synergies that can strengthen knowledge integration, and overcome barriers to innovation. SE can therefore be argued to take the triple helix to its next stage of development. Within the Chinese context, the university argues that SE provides opportunities to train syntegrative elites with international perspectives and attainments, discipline-specific knowledge, management skills, and a wide adaptability in industry, achieving this through emphasizing higher order thinking skills, allowing learners to actively contextualize and produce data and information, instead of just acquiring it. When referring to elites, this is a typical way of describing those students who are destined for managerial or leadership roles within private industry or state-run business.

Teaching within China is often considered to follow a 'traditional' model or follow a Confucian model (Marginson, 2011), where traditional means following a more transmission model, characterized by teachers being the centre of the class, clear structure to the lessons, and passive students who have little opportunities to apply new knowledge (Looney, 2009), as well as state control of what is taught within the curriculum, when and to what age group. The SE philosophy of the university is innovative in that it is breaking with both transmission and Confucian models in encouraging change within the classroom by being more student-centred and based around problem solving. To achieve that, the concept of the classroom has been challenged and includes workspace within industry or business partners' premises, as well as much greater use of flexible learning spaces so that the lecturer is not the main focal point.

The Entrepreneurial College

To enable the concept of SE to be fully developed, the university has established and built an Entrepreneur College at a new campus, where students can study and graduate with both disciplinary knowledge and practical industry attainments, as well as cross-cultural leadership, management, and entrepreneurship skills, making the students ready for future

employment opportunities within a future industry 4.0 world (Orazbayeva *et al.*, 2020). By developing a new campus based on the new philosophy, students will be less burdened by their traditional and Confucian learning philosophies that they had been exposed to all through their pre-university education. All degrees have been developed by equal partnership with established businesses in specific fields/industries, identified jointly with the local government partner, the business partner, and the university strategic plans. The college brings together education, government and industry so that students and the curriculum they study on are better aligned with the need for business innovation in a fast-changing industrial landscape, in line with central government calls from the Ministry of Education. The industry partners have been involved in the initial development of the curriculum, identifying what modules should be included. They have discussed the skills that students need when they graduate, and indicated what learning and teaching approaches would best provide these skills. Industry has provided syllabus content, co-teach in many cases, and provide teaching spaces for problem-based learning and teaching activities. Assessments have been changed to ensure that both academic knowledge and soft skills are assessed, though it must be stressed that all assessments are marked by academics to academic criteria and rubrics.

Developing an Undergraduate Research, Scholarship, and Creative Inquiry (URSCI) Curriculum

Education innovations are often seen as changes in processes (Looney, 2009) such as improved ways to deliver classroom-based teaching, learning and assessment, as well as changes in the organisation, or governance of systems. Examples may include the flipped classroom, hybrid learning and teaching techniques as a result of disruptive technologies, and industry-based learning and teaching opportunities. Many of the teaching practices that have been developed, or adopted, are in many ways similar to those identified through the HIP initiatives within the USA, but with one difference in the way that industry is involved in the co-creation and co-delivery of the curriculum, and providing space for the practical classroom.

The Entrepreneur College was initiated in September 2019 with 274 students studying on six entrepreneurial degree programmes, within six industry-themed schools, with each degree following the same degree structure. With the opening of the new campus in September 2022, student numbers will have reached over 1200, whilst an additional degree programme was launched in September 2021 (Table 1).

Table 1: Entrepreneur College (Taicang) Industry Schools and initial degree programmes

School	Founding Degree Title
School of AI and Advanced Computing	BEng Data Science and Big Data Technology with Contemporary Entrepreneurialism
School of Internet of Things	BEng Internet of Things Engineering with Contemporary Entrepreneurialism
School of Robotics	BEng Intelligent Robotics Engineering with Contemporary Entrepreneurialism
School of Intelligent Manufacturing Ecosystems	BEng Intelligent Manufacturing Engineering with Contemporary Entrepreneurialism
School of CHIPS	BEng Microelectronic Science and Engineering with Contemporary Entrepreneurialism
School of Intelligent Finance and Business	BSc Intelligent Supply Chain with Contemporary Entrepreneurialism
School of Cultural Technology	BA Arts, Technology and Entertainment with Contemporary Entrepreneurialism

All degree programmes follow the same structure, with Year 1 students all studying common core subjects in the main university campus, before moving to the Entrepreneur College. For Years 2–4, 75% of the time is spent studying the degree subject and 25% studying on an entrepreneurialism minor, which is common for all seven degree programmes. In addition, all students must complete 600 hours of a professional development programme (PDP), which is split into 200 hours over three years. The programme design and educational philosophy allow for, and actively encourage, meaningful contributions from industry partners which are unique within the Chinese context and partially based on the German model highlighted earlier, contributing to the development of an undergraduate research, scholarship, and creative inquiry (URSCI) curriculum. The following sections provide more detail of the curriculum.

Learning and Teaching

The philosophy of the college is to align universities better with business innovation in a fast-changing industrial landscape, create the right talents for tomorrow's employers, and create "SMART" knowledge-driven and informed leadership. Developed as part of the degree programme, though outside of the credit structure, all students must complete 600 hours of a professional development programme, which is split into three amounts of 200 hours. The first 200 hours involves what has been named an externship, with guest speakers from industry related to the degree subject, and company visits, completed by a small project set by industry and a reflective report. The second 200 hours at the end of Year 2 is problem-focused, based around real problems which have been proposed by industry partners or mentors. Working in small groups, students take responsibility for how the project develops, researching solutions and presenting them through posters, which are peer assessed. Industry mentors provide support for each group and additional assessment grades. The final 200 hours, at the end of Year 3, is more of workplace-based practice, where students are placed within industry and work with industry mentors to test ideas in practice, evaluate their assumptions in professional settings, and to begin to chart their future career trajectories.

A number of initiatives and developments have indicated the need for more innovative teaching methods to prepare students better for future employment. These include the development of disruptive technologies through industry 4.0, the Chinese government request for more entrepreneurial education and its "Made in China 2025" initiative, and research by organisations such as the UK Quality Assurance Agency (QAA, 2018). The QAA (2018), for example, suggests that delivery methods should provide the opportunity for students to solve problems, be action and practically based, set by industry or the community, be cross-disciplinary, use expert specialists, use experiential learning strategies where theory follows practice, and make distinctions between learning about, learning for and learning through for entrepreneurial education.

The Entrepreneur College, through SE, has adopted a position of encouraging student-centred and active Learning, and Technology-enabled teaching. Problem-based learning and teaching (Savery, 2006), which utilize a project-based approach (both known as PBL), are common with the projects and problems coming from industry partners. Through lectures and problem-based workshops, students are able to see the relationship between academic concepts and real-world issues. Particularly when studying the entrepreneur modules, where students from all disciplines come together, PBL gives the students key skills such as conflict-resolution, resource allocation, teamwork, and cooperation (Duch *et al.*, 2001).

Classes are delivered in condensed form over a short time period (5–6 weeks) (Ho and Polonsky, 2009), using block or intensive teaching patterns for the entrepreneurial degrees from Years 2–4, with students completing one set of modules before moving to the next. Studies have suggested that block teaching has advantages such as increasing student motivation and concentration, building stronger relationships (Davies, 2006), and improving levels of attainment and knowledge retention (Sheldon and Durdella, 2009). These advantages have much in common with HIPs, perhaps unsurprisingly, as many of the practices that are used within the intensive delivery mode are similar.

One country that has taken to block teaching at university level is Australia. At one institution, for example, block teaching started in 2018 at undergraduate level, and in 2019 at postgraduate level, with the aim to have all courses by 2022 (Ross, 2019). The university claims that students' performance has improved as a result, possibly due to the increased confidence that students gain with the problem-based approach used. Other Australian universities have also reported similar findings, with better performance amongst non-traditional students, such as those working or with limited time commitments being identified (Loton *et al.*, 2020). However, block or intensive teaching is not without problems, with Swain (2016) highlighting issues related to transition to the new teaching method, Dixon and O'Gorman (2020) suggesting that such delivery patterns may be better suited to subjects where skills acquisition is needed compared to more theoretical subjects, such as those found in the Entrepreneur College, and Nerantzi and Chatzidamianos (2020), suggesting that block teaching requires changes in the pedagogical approach, such as greater student-centred learning based around problem-based learning and teaching approaches. To this I would also add that there needs to be support for academic staff transitioning from traditional to more innovative teaching pedagogies, such as block or intensive delivery, for its effective use.

The move towards technology-enabled teaching has also enabled the introduction of the flipped classroom alongside the block or intensive delivery pattern. Lage, Platt and Treglia (2000) describe the flipped classroom as one where activities traditionally completed outside of the classroom such as homework are conducted in the class, and vice versa. This means that a three-stage approach is typically followed, where lectures need to be recorded, PowerPoint presentations need to be made available to students on the virtual learning environments (VLE) prior to lessons, and further work added after classes informed by what happens during the classes' discussion (Estes, Ingram and Liu, 2014). Rotellar and Cain (2016) suggest that this enables the lecturers to add (or create) value to the class, as it enables them to show students how to reason through and approach problems in real-life scenarios. As well as being more student-centred (Long, Logan and Waugh, 2016), the flipped classroom provides students with time to read and revisit a wide range of materials meeting the needs of a diverse range of learners (Lo and Hew, 2017). The signs seem to be encouraging, with Perrin (2022) suggesting that both students and staff soon become fully accustomed to this style of teaching.

The adherence to a technology-enabled and student-centred teaching philosophy, which has enabled the use of block teaching and the flipped classroom, has also meant that there has been the opportunity to introduce problem-based learning and teaching activities both within the class and before/after classes. Problem-based learning does mean that the role of the lecturer changes, in that they need to develop activities that will motivate and encourage students to take responsibility for their own learning (English and Kitisantas, 2013), though this can be challenging (Perrin, 2022). Perrin (2022) highlights issues such the time commitment to ensure that students are mentored properly, which may be outside formal office hours, and teaching the students to acquire the skill sets needed to be successful, as

well as motivating students to try something different. Time is limited with the intensive teaching method, and experience within the Entrepreneur College suggests that induction weeks at the beginning of each year are essential to ease students into the teaching philosophy. In addition, staff training courses as part of a Continuing Professional Development Framework have been instigated during the summer for both new and old staff to ensure that they are best prepared for the coming academic year.

Often associated with problem-based learning is project-based learning and assessments. Project-based learning is also student driven, is seen as essential for success in the modern workplace (Bell, 2010), and needs to be facilitated by the lecturer, indicating a further role change. Bell (2010) further highlights the advantages of the approach, such as acquiring new technological skills, and becoming proficient problem solvers, all of which have been highlighted as 21st-century skills (Larmer and Mergendoller, 2010). With industry-focused degrees, the involvement of industry partners, in assisting in the design of modules, the setting of assessments, and the development of skills-based additional study, ensure these skills are developed. The experience of the Entrepreneur College, however, suggests that industry partners are time limited, and that it is essential to have champions within company who are key contacts, set up projects and liaise within the business.

Graduate Attributes – Outcomes

Having redeveloped a URSCI curriculum with the preceding principles in mind, the next step is to ensure that some level of entrepreneurial competencies is derived from the curriculum (Lackeus, 2015). Entrepreneurial competencies can be seen as a form of graduate attribute. Azevedo, Apfelthaler and Hurst (2012) highlight the worldwide nature of graduate attributes as a way to promote national competitiveness in the global economy. This paper has already highlighted concerns by business as to whether graduates have the correct skillsets to be employable and competitive. Graduate attributes are sometimes seen as being generic or soft skills, the type that are transferable between different disciplines or careers (Nagarajan and Edwards, 2014), though Kamvounias and Thompson (2008) argue that graduate attribute development takes place mostly within disciplines. Hager and Holland (2006) highlight that often it is unrealistic for universities to guarantee that students can meet the outlined attributes, suggesting it would be more realistic to provide students with as many opportunities as possible to develop these skills through their studies. Azevedo *et al.* (2012) highlight the role that accreditation bodies play in the discourse on graduate attributes, often highlighting the skills that need to be identified. For example, the QAA (2018) report and guidance for UK Higher Education providers on Enterprise and Entrepreneurship Education suggest that institutions should provide programmes for students that are inclusive, innovative, enterprising, reflective, engaging, enabling and relevant.

The QAA (2018) goes on to suggest that the overall goal of Enterprise and Entrepreneurship Education (as they call it) is to develop entrepreneurial effectiveness. This is consistent with Lackeus (2015), who suggests that developing some form of entrepreneurial competencies was the aim of entrepreneurial education. Lackeus (2015: 12) summarizes these competencies as “knowledge, skills and attitudes that affect the willingness and ability to perform the entrepreneurial job of new value creation”. Farrington *et al.* (2012) see similarities between these entrepreneurial competencies and non-cognitive factors such self-efficacy, learning skills and social skills, which Moberg (2014) suggests are acquired through learning by doing, which describes the approach adopted within SE modules (Figure 1).



Figure 1: Graduate attributes developed through Syntegrative Education

When being developed, each programme has to indicate how it enables students to meet these attributes through statements in its programme learning outcomes. This is also the case for module learning outcomes at the module level. When designing assessments, module leaders are also required to highlight how the attributes are measured within the assessments being developed. The SE philosophy embedded across programmes supports the notion that entrepreneurs are imaginative, yet critical, willing to take informed, but calculated risks, expecting success, but equally capable of learning from failure. Moreover, new opportunities are sought by both students and teachers, who are not afraid to face new challenges, and wish to make a difference to society and to their chosen professions. As a result of this approach, the research, scholarship and creative inquiry curriculum that has been developed aims to ensure that graduates should be able to *act decisively* to solve issues through practice or real-world experience, *collaborate* with all possible stakeholders, *challenge* the unchallengeable, *embrace* uncertainty and disruptive technologies, and *reflect* to ensure all experiences are possibilities for learning and creating value added. It should be noted that the Entrepreneur College is at the start of its journey, and further work will be needed to establish how successful its entrepreneurial-focused qualifications have been at producing graduates with these attributes.

Discussion

The Digital Vortex study (Yokoi *et al.*, 2019) of key industries suggested three years ago that digital disruption was fully under way, with the vast majority of respondents to the study acknowledging the transformative impact that it would have on their industries. The main industries most vulnerable to digital disruption identified in the study are Media & Entertainment, Technology Products & Services, Telecommunications, Retail, Financial Services, Transportation & Logistics, and Education. Five of the first six are areas that the Entrepreneur College has chosen to focus its industry degrees on, with its industry partners committing to SE and the entrepreneurially focused qualifications that provide the potential solutions to the disruptions that they face. The partners see the coming together that SE offers,

and the innovative approaches to learning and teaching within its degree programmes as a keyway to respond to digital disruption.

However, digital transformation programmes such as those at the Entrepreneur College can also lead to high levels of confusion and uncertainty, which increases the importance of developing agile URSCI curricula to meet these challenges, by enabling students to acquire enterprise awareness. Students acquire this by developing knowledge and understanding of enterprising and entrepreneurial activities (QAA, 2018) through degree programmes such as those offered within the Entrepreneur College, including research and creative inquiry built into the curriculum that enables an appreciation of the pace of change, and the value of ideas that can be expected when they graduate. The innovative initiatives that have been established by the development and adaptation of an URSCI curriculum through SE, within the Entrepreneur College and its industry-focused undergraduate degree programmes are aimed at developing entrepreneurial competencies. Referring back to Fernandez-Nogueira *et al.* (2018), the following paragraphs illustrate from the discussion how, through the development of a URSCI curriculum, the Entrepreneur College enables the institution to meet the good practices required for entrepreneurial education.

The curriculum is *innovative* within China in that it has been developed with industry as an equal partner, has three parts with its minor in Entrepreneurialism and PDP as well as the subject major, is student-centred, research-led and technology-enhanced, has developed a delivery style that is relevant to future work patterns, has research at its core in problem-based assessments, with all degree programmes aligned with graduate attributes. The curriculum is also *transferable* in that the skills learnt in the major are applied also in the Entrepreneurialism minor and, vice versa, are also applied within the summer PDP with and within industry. The attributes that students graduate with are equally transferable from the education context to the workplace, a key component of a URSCI Curriculum. The curriculum is *transversal*, in that it relates to preparing students for a global workplace rather than a localized work environment. Digital disruption has changed how we work and live, and the curriculum, through its focus on soft skills (or entrepreneurial skills and mindset) developed through project and problem-based learning in a student-centred learning and teaching environment prepares students for this disruptive world.

The curriculum is *sustainable* through solid organization of the Entrepreneur College, the integration of SE as the educational philosophy which guides all practice, and training of staff and students in studying in the block teaching and student-centred pedagogies that are different to the traditional transmission and Confucian educational models experienced in high schools (Looney, 2009; Marginson, 2011). The curriculum is also *effective* in that it is innovative and has a positive impact on how students are prepared for the digital work environment. Sagar, Pendrill and Walling (2012) highlight that the key factors for effective success include support from the organization, the capacity to build organizational strength, and the need for clear goals and incentives. All of these are possible through SE and the development of the Entrepreneurial College, which provides institutional support for the development of the URSCI curriculum. The curriculum is *efficient* in that the outcomes, though it is acknowledged that this is still at an early stage, are in line with expectations. The college has grown from just over 200 students in 2019 to over 1 200 students in 2022, the number of industry partners has increased as industry engages with the degree programmes, the opportunities available to students increase as the curriculum develops and changes with growth and new pathways for each school, reducing costs (both financial and non-financial).

The curriculum has *impact*, with two of the stated aims of both SE and the Entrepreneur College being to facilitate the development of new technology for industries, explore the development pattern of new industries, and lead on the growth of industries in a healthy manner; and to seek a solution for role of University and the Campus of the Future. This is being done through the development of the curriculum, the development of training programmes across the university to train academics and administrators in other Chinese universities, and the success stories of undergraduate students who are winning regional and national awards in student competitions through research conducted as part of the degree programme with industry. Finally, the curriculum is *evaluative*, in that it has three levels of monitoring to ensure continued improvement. These are weekly feedback sessions, module feedback at the end of individual teaching blocks, and module feedback at the end of each academic semester. In addition, there are annual assessment and evaluations at an institutional level, with industry partners, and through regular student forums. Students are a partner in curriculum development along with industry. As Fernandez-Nogueira *et al.* (2018) highlight, evaluation and monitoring are essential in improving and assessing the significance, flaws and benefits of the curriculum and pedagogy used.

Conclusion

Undergraduate research, or research-led teaching, is an inquiry or practice undertaken by undergraduate students that enables them to 'learn through doing' and to make an intellectual or creative contribution to the discipline. Reports commissioned within the USA (see Altman *et al.*, 2019; Finley, 2021), for example, suggest that businesses are more likely to consider hiring a candidate with experience in undergraduate research, emphasizing the soft skills that undertaking research brings. The development of Syntegrative Education and the Entrepreneur College, the partnership with industry and focus on student-centred, research-led and technology-enhanced learning and teaching means that a URSCI curriculum is not only possible, but thriving, and in the future, we will perhaps see more institutions making the same steps to interact with industry in creating a value-added education experience suitable for the 21st century.

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