An Exploration Of The Innovations In Teaching 21st Century Skills Within The Australian Tertiary System

**Abstract**

The modern world is presenting a variety of challenges to the future worker. To meet the challenges, our educational system needs to be adapted to allow young workers to develop the skills required by the modern workplace. By innovating classroom activities and assessments, the tertiary system has an opportunity to engage today’s youth to learn not only the content of their classes but also the skills to navigate an innovative world. While innovative means of educating youth are known and being researched, there appear to be barriers preventing their widespread adoption in the tertiary education sector. Ranging from cultural perceptions on the nature of teaching, a lack of pedagogy training to educational staff, to rigid control of course by the university system. While progress is being made by those engaged with the issue, this case study presents a reflective point to innovators about potential challenges to implementing innovative ideas in an already established industry.

# Introduction

Change and innovation are realities that humanity often appears to have a love-hate relationship with; every new technology that affects how one lives their life often spawns a wistful romanticism to how things once were. In the modern technological era, this change is happening at an increasing rate, and while people may object to the need to adjust to the realities of the new world, the momentum is difficult to resist. There is myriads of studies that indicate that so-called ‘21st-century skills’ are ones that will define an individual's success in the economy of tomorrow, and developing these skills in an educational environment is essential for having a well-rounded and adjusted innovative future worker. This need to prepare our youth to be able to match the jobs of the future has already been highlighted as essential with the UN’s Sustainable Development Goal for job growth having a specific target on youth employment (UN, 2015). Therefore, the primary question of this paper is what innovations are being developed for the teaching of 21st-century skills in a tertiary environment, as well as an exploration whether there are obstacles preventing these identified innovations from becoming the norm throughout the sector.

This paper is built upon literature that extensively explores the necessity of the skills for youth, as well as posits possible solutions to the training of said students. An extensive literature review will be presented that shows these conclusions, but also highlights that the studies have not looked specifically about what barriers are present to the adoption of these innovations in the geographic area in focus within this paper, Australia. To further understand the local context about the implementation of the identified innovations, multiple interviews were conducted with educational professionals to get their perspectives on innovation in their sector. From these interviews, it can be determined that 21st-century skills and the teaching of them are important goals for preparing the workers of tomorrow. In addition to reinforcing the conclusions of the literature, it was also determined that there are barriers to the adoptions of these practises, but progress is being made in the tertiary industry.

# Literature Review

The changing nature of the modern economy is something that has been known for a long time. The rapid pace of industrialisation starting in the late 1700s precipitated vast changes work for the common citizen with large movements of labour from the field to the factory. These changes precipitated the need for a new type of worker who was familiar with repetition as well as basic level contents of reading and arithmetic (Autor, Levy, & Murname, 2003) as from this need developed an international norm of universal education to develop these skills and areas of knowledge. With continued technological throughout the 20th century, particularly following the Second World War, the nature of work shifted again with many of the major economies developing from ones of manufacturing to service. With the shift to a service-based economy the educational system shifted again to meet the need of the service worker with a large expansion of tertiary institutions and programs training the professionals of the age; doctors, lawyers, analysts, business executives, etc. (Autor et al, 2003; Griffin, Care, & McGaw, 2012). It has now been identified that we are in another shift of economic reality with Industry 4.0 indicating that developed economies are moving to ‘information economies’  and much like with previous epochs of economic history, the education required for those working in this environment will need to change and adapt as well (Griffin et al., 2012).

When considering the nature of the adaptation that is needed to meet the demands of the information economy, researchers must first identify what skills the most successful in this age should possess to be able to navigate the new challenges. It has posited that the changes in the economy will mean that workers will not be working for one company for most of their career, instead, moving through over a dozen different employers by average (Cappelli, P., 1999). This movement means that adaptability, critical thinking, and an ability to learn are essential as the modern worker will constantly be exposed to new scenarios (Trilley, & Fadel, 2009; Griffin et al., 2012). With the complexity of tasks that face modern professionals, it is the case that it is rare for a single worker to have all the competencies and knowledge to deliver the best results; therefore a strong ability to collaborate and work as part of team mark the best employees for an organisation. The world in the new information economy is incredibly integrated, which means that workers must understand the importance of networking as well as a sense of global citizenship so that they are better able to connect with colleagues from around the world (Trilley, & Fadel, 2009; Wagner, & Dintersmith, 2015). This ability to integrate is brought about by the utilisation of technology in the day to day work activities of employees which means that those successful in modern challenges are those who can capture the advantages of all the innovations that are being developed. All these examples of new skills that shall be required to fall under the category of “21st-century skills”.

With the understanding of the need for these skills, a refinement of what the skills are, how to teach them, and importantly, how to assess, was needed. The most comprehensive academic picture available currently is that of the Assessment and Teaching of 21st Century Skills (ATC21S). A multinational collaborative industry-academic project, the ATC21S endeavours to develop a comprehensive understanding of 21st century skills as well as provide a realistic framework by which the teaching of them can be rolled out to educational systems around the world (Griffin, Care, 2015) and as such forms a large foundation literature foundation for this paper. However, the ATC21S is not comprehensive in its scope as it focuses primarily upon the assessment and not so much on the nature of student learning.

When it comes to learning well the subject they are exposed to, Nilson (2010) posits that there are three primary avenues of engagement: 1) teacher to student, 2) student to student, and 3) student to content. That challenge for a university educator is, therefore, the question of how to be able to balance these streams so that knowledge is best taken in. For example, Eric Mazur of Harvard University often reflects that when he started lecturing, he was certain that he was doing an excellent job at helping his students learn (Wagner, & Dintersmith, 2015). In the 1990s, however, he became familiar with a study by Hestenes, Wells, and Swackhamer (1992) regarding the utilisation of knowledge by physics students. Upon testing his students with the new type of test, Mazur was surprised to learn that his student’s failed miserably, in the process of solving this problem he came to understand that he was relying upon lecturing too much rather than letting students do the learning (Wagner, 2015). In 2001, he published a paper (Mazru, & Crouch, 2001) demonstrating the benefits of student-led streams of learning, from which Nilson (2010) got their conclusion of the balanced access to learning materials. Combined with later studies (Freeman, Eddy, McDonough, Smith, Okoroafor, Jordt, & Wenderoth, M.P., 2014) it appeared that a learning environment consisting of lectures and readings did not provide an environment conducive the learning and adoption of 21st century skills (Wagner, & Dintersmith, 2015) but instead active engagement during class time and ‘flipping’ the lecture led to long term learning of content and skill (Mazru, & Crouch, 2001).

Ideally, assessments make up an important pillar of the learning environment (Nilson, 2010) but a current challenge in the educational system is how to develop modern assessment for the learning of modern skills (Care, E., Kim, H., 2018). A large issue for the modern student is that often they require context and explanation of the task rather than just wanting to jump only to engage (Nilson, L.B., 2010). The problems stem from Gulikers (2004) recognises as a problem of ‘assessment authenticity’. To this framework, assessments must carry with them relevance to the expectations of the student bring about an authentic learning experience while doing the assessment (Gulikers, 2004). This issue is compounded when the nature of the skill being assessed is one that does not match historical norms of assessment (Care, E., Kim, H., 2018). Combing the theories of Gulikers (2004) with the ATC21S, it is seen that assessment built upon the interests of the students either through self-directed exploration or assessments that match industry tasks will help provide the authenticity of the assessment, preferably in a context that encourages positive group interaction as well as possibilities to be creative (Grasser, Foltz, Rosen, Shaffer, Forsyth, & Germany, 2018).

With two decades of research indicating that interactive classroom experiences along with authentic assessments lead to the best learning outcomes for both base level content and 21st-century skills, the question now remains why exactly these prescribed methods are not more common through the entirety of the educational system? Adamson & Darling-Hammond (2015) as part of the ATC21S, identified the scale of the issue is a large constraint when dealing with the implementation of these ideas on a national scale. However, for context, it must be understood that their focus is primarily upon primary and secondary education, with which the nature of national assessment produces the large issues of scale (Wagner, & Dintersmith, 2015). On a tertiary level, it is not required for standardised testing to be enacted across all institutions. Additionally, the nature of the tertiary curriculum is also more flexible as like with the assessment can match the individual institution rather than a collective norm across the entire industry. Trilling and Fadel (2009) posit that there a multitude of factors preventing widespread adoption ranging from cultural perceptions on the nature of teaching, parent expectation on the content to be covered in class, to the need for a system to deliver a designated uniform product to a large group of unique individuals with different learning styles. Ultimately, understanding may also be found in the work of Bransford and Schwartz (2009) where they highlight the difference in between one gaining a ‘learning expertise’ as opposed to a ‘teaching’ expertise. Barriers to implementation of innovation could because the primary educators in the tertiary system are necessarily trained to be educators.

It is in this area where the identified literature is sparse. The ATC21S, the most comprehensive collection on the subject of teaching 21st-century skills, deals directly with secondary education, and its analysis regarding blockages to the adoptions of 21st-century skill instructions focuses upon that (Adamason, Darling-Hammond, 2015). Trilling and Fadel (2009) put forth some hypothesises on the subject. However the data backing up this understanding is not comprehensive. Further research to form at least a beginning foundation in the understanding of barriers within the tertiary system is required.

# Methodology

With an understanding of what the literature lays out, further exploration of the question at hand is provided by undertaking interviews with educational professionals. The scale of this paper constricted the authors to only interviewing two individuals working in the field as university professors. As it is not feasible to get a large sample size to draw quantitative conclusions, this paper will be basing its discussion on a qualitative analysis of the two 45-minute interviews conducted with the participants. These interviews were informal of nature as the researches intended to allow the participants to have space to develop their thoughts and direct the conversation to their areas of interest/expertise. This is not to say that the questions were not related to literature, the authors approached the interviews with a deductive mindset, being that a firm literature base was being expanded upon by the participants.

The interviews will be considered primarily in a thematic methodology as per the recommendations present in Saunder, Lewis, and Thornhill (2016). The primary means of analysis will be the considerations of topics covered within the interview and how they relate to the research question presented in this paper. The broad covered will be the participant's interpretation of the modern skills needed, whether they’re utilising modern innovations in educating youth about these skills, and what their experiences have been regarding implementing innovative teaching activities.

# Discussion

At the beginning of the interview, the participants were asked about what they felt would be the defining or essential skills for young people moving into the workforce. Both participants were quick to point out skills that were relevant to their fields, which were the same as those identified in the literature. Dr Sukunesan (2019), of Swinburne University, spoke highly of communication skills being essential in the modern workplace particularly focusing on the importance of students to be able to develop skills in the social media sphere. Dr Rixon (2019a), who was the second participant from Swinburne University, also spoke highly of communication but for him, it was primarily in the context of being able to network. Dr Rixon (Bates, Rixon, Carbone, Pilgrim, 2019) has also recently published a research article discussing an individual’s ‘professional purpose’ as a means by which many of the skills identified as 21st-century skills can be developed. He discussed how that once a worker can find purpose their tasks, their ability to think creatively, critically, and have the grit to persevere through the task is greatly enhanced and developed.

The experience of both the participants as educators, as well as in other fields has reinforced the idea of modern baseline skills being necessary to be a successful modern worker. This was encouraging for this paper as it provides contextual validation of the assertions found within the literature. While their experiences support these needs, neither was familiar with a lot of the research in the field. This can be taken as both a positive and a negative regarding since it is promising that these educators are able to perceive the need to go beyond just interacting with a base level of content of a course however the fact that they are only using their experience and are not utilising all of the resources on this subject. This contextualised nature of knowledge may have the possibility of preventing a wholistic view of the diverse skills that have been identified (Binkley et al., 2012). This is not to say that either participant was flippant about the importance of any other category of skill, rather that they each had an area of focus that was present in their methodologies of teaching these skills.

The next thematic area of interest in the conducted interview was querying the participants how they thought the 21st century could be developed within the tertiary environment. To begin with, Dr Sukunesan (2019), as his course specifically concerns social media trends, he implements communication between students in as many ways as possible to get them used not only to communicate with one another but also to utilise technology as the means to do so. The example that he offered us was that during tutorial sessions, he assigns Twitter hashtags to the questions and allows for students in other classes to participate using these hashtags (Sukunesan, 2019). This is quite the impressive innovation by Dr Sukunesan as it encourages not only practise in a modern form of communication but also directly integrates technology into the learning atmosphere, the skilled use of said technology being identified as a highly pertinent aptitude considering the rate of technical innovation. While he did rationalise it as such, Dr Sukunesan is also in the process of developing innovations in his lecture delivery methods that provide excellent practise for utilising technology as a means of accessing information. He is in the process of creating a system of recording a lecture while also being able to convert the audio into a text-based format. These transcripts are then distributed to the student body in such a format that they can search the document, highlight relevant information, and proceed to a timestamp in the audio itself.Dr Sukunesan is very encouraged by this technical innovation as a means by which students who either studying from long distance or are unable to consistently attend a lecture can still access the knowledge that he is presenting. While it is an excellent goal to increase accessibility, the fact that it also aligns with developing skill in the positive use of technology to bridge these distances is also extremely valuable.

Dr Rixon (2019a) provided excellent examples of ways to be innovative in teaching 21st century skills, particularly in the areas of collaboration and networking. In the units that he teaches, to highlight these skills he structures the group work with a series of gates throughout the semester which in his experience requires the team to collaborate for longer. During this time as well, each team is assigned an industry professional who works as an advisor to the group while they’re producing their final product whatever that may be. In his experience, Dr. Rixon (2019a) finds that this method aids in developing a sense of ownership and responsibility within the team members while also allowing every team member an opportunity to practise, and realise the benefits of, networking with industry professionals. This technique of consistent assessment of tasks throughout the semester is supported by Nilson (2010) as a way of managing the oft fraught group project experience.

The importance of motivation presented an interesting difference between the participants of the study. When discussing the subject, Dr Sukunesan was very clear that motivation in his mind had to come from the students even to the point of assigning students to work groups based upon the level of motivation that he perceived. On the other side of the spectrum, Dr Rixon appeared to actively work to increase the level of motivation within the student body by utilising the concepts of professional purpose (Bates, Rixon, Carbone, Pilgrim, 2019b). This methodology of Dr Rixon’s also aligns well with the research presented by Gulikers (2004) that assessment that has an authenticity to the students will also be able to increase their intrinsic motivation to engage with the task. A possible point to the difference between the two participants can be from their backgrounds, Dr Rixon has only been in academia for the last few years after moving on from a successful career in the corporate world working with dysfunctional project teams. As a consultant, he was tasked with engaging and motivating these teams, and he appears to have brought not only the skills in doing so but also the motivation to build a learning environment for those with whom he is engaging.

This concept of a learning environment was discussed with both participants utilising the question from Wagner (2015) about whether each man felt themselves to be a teacher or there to help people learn. This discussion moved on to the area of lecturing and how students engage with the teacher as a means of learning. Here again, we find a difference in style between the two participants that somewhat is indicative of professional history and expectations. While Dr Sukunesan does an extensive amount of innovation within the means of how he gives his lectures, it appears that he does prioritises content passing from him to the students. He could instead adopt a methodology, as presented by Mazur (2001), whereby the primary focus of the teacher is to facilitate student interactions as a means to learn the content during the face to face time. There is, however, interaction with the planning setup of Dr Sukunesan, with his tutorials utilising innovations in the use of Twitter to encourage student engagement. To Dr Rixon, lecturing is an inescapable part of his role however he structures his lessons in a 1 – 1 – 1 play, with lecture, tutorials, and online contents such as quizzes and forums making up the third slot. Both participants it does appear move beyond the historical convention of utilising lectures as the primary means of student engagement and instead manage to find a good balance of the three sources of knowledge as discussed by Nilson (2010) being teacher-student – content. It is in the opinion of both interview subjects that the nature of the lecture environment is not conducive to deeper learning of either 21st century skills or the content that is being presented, opinions of which match those of writers on the subject (Mazur, 2001; Wagner, & Dintersmith, 2015; Scardamalia et al, 2012)

When queried about why, in their opinion, the lecture format is the norm in the tertiary education system, rather than the adoption of new methods, both participants raised similar issues. Dr Sukunesan (2019) mentioned that due to the research focus of most of his peers, they defaulted in their teaching methods to those methods that they were familiar with from their past, i.e. lectures. This combined with assessments that were large and easy to grade in bulk meant that the time constraints placed upon these researchers, estimated to be 1 hour per semester per student for marking, was kept at a manageable volume. Dr Rixon (2019a) is of a similar opinion that the faculty are not engaged in innovating their styles of educating to match that of best-known practise due to both workload and familiarity with what modern practise can be. Dr. Rixon mentioned that the training and support system supplied by his institution for educators to learn new methods is over an informal lunch that happens only intermittently.

The final aspect of the conversation with the participants was regarding how well they were able to bring about new ideas into their teaching environment. Both men explained that there are guidelines developed by their institutions in which all the aspects of their course to fit. This means that the content to cover, the skills to develop, and in some ways, the nature of the assessments are being set to meet university guidelines. While Dr Rixon (2019) did mention that there is some leeway by which he can decide how to proceed with engaging his class, he does still have to answer to university bureaucracy and justify his decision so that the course can continue to be accredited.

Both Dr Rixon and Dr Sukunesan have positive feelings about the direction that the educational system is moving towards regarding understanding the most pertinent skills and content to expose to today’s youth. In addition to the development and implementation of innovative techniques within the classroom, they are also developing knowledge and technology outside of it. Dr Rixon is currently undertaking a study regarding the concept of ‘belonging’ and how building a student’s sense of connection with the course they are undertaking can increase their engagement and satisfaction with the course in which they are enrolled. Dr Sukunesan is refining the technology he utilises in the lecture environment via a start-up and collaboration with industry actors (Rixon, 2019a; Sukunesan, 2019).

From the data provided the interview subjects, it appears that in the university system within Australia that innovation can occur. With his knowledge of social media, especially Twitter, Dr Sukunesan can bring in trends and understandings from outside the purely academic field and use it to both engage with his students and encouragement amongst them. Dr Rixon, on the other hand, is implementing knowledge and skills gained as a corporate team consultant to foster a knowledge building environment within his classroom. These are excellent examples of innovation, but both are tied to individuals who are going beyond the norm of what the tertiary environment seems to require of them. The organisational system in which they operate does not seem to push for this form of innovation to be the norm so that the modern needed skills are learnt in the best fashion. It is a possibility that what is required is more documentation about the on the ground actions of educators like those who kindly sat down to interact with this research paper.

# Conclusions

It is safe to say that the nature of the world is constantly shifting and changing. How society adapts to those changes can, in many ways, mark a society to succeed in the new world or be overtaken. If society is looking for tomorrow and getting ready to match the challenges it presents, it is essential that a clear focus is made on preparing youth for those challenges. This paper has endeavoured to briefly explore some of the way’s society is figuring out how best to train the workers of tomorrow for the world it is currently building. It’s clear to say that academic and industry have recognised what the challenges will be and have begun exploring how those innovations in education can be applied. This is not to say, however, that these innovative techniques are the norm through the whole educational system. To understand why, interviews were conducted with educators to gain their perspectives on the need for these innovations, what they’re doing in their practice, and their views on the direction of education in the future. Their experiences have aligned with the consensus seen in the literature, new skills are vital, and a shift to focusing on their development is possible and beneficial students. However, to the perspective of the interview subjects of this paper, there are institutional barriers preventing these innovations from becoming more commonplace. A lack of support and training for educators to build knowledge generating spaces is preventing these teachers from moving beyond their cultural perceptions of what it means to be an educator. Combined with inelastic institutional policies, innovation in the tertiary sector has a possibility of falling behind the pace of change with society. By identification, issues can be solved through further effort and it, therefore, the advice of this paper to further explore these barriers to innovation as lessons and understanding of what hold ideas back going beyond just the sector in question for this research, but to every avenue of knowledge that society desires to explore.

# References

Adamson, F., & Darling-Hammon, L. (2015). Policy pathways for twenty-first century skills. In P. Griffin et al. (eds.), *Assessment and teaching of 21st century skills: Methods and approach* (pp. 293-310).

Auter, D. H., Levy, F., Murnane, R.J. (2003) The skill content of recent technological change: an empirical exploration. *The Quarterly Journal of Economics, 118(4)*, 1279-1333.

Bates, G.W., Rixon, A., Carbone, A., & Pilgrim, C. (2019). Beyond employability skills: Developing professional purpose. *Journal of Teaching and Learning for Graduate Employability*, 10(1), 7-26.

Bransford, J.D., & Schwartz, D.L. (2009). It take expertise to make expertise: some thoughts about why and how and reflections on the themes in chapter 15-18. In K.A. Ericsson (Eds.), *Development of professional expertise: Toward measurement of expert performance and design of optimal learning environments* (pp. 432-448)

Cappelli, P. (1999). Career jobs are dead. *California Management Review, 41(1)*, 146-167.

Care, E. (2018). Twenty-first century skills: From theory to action. In P. Griffin et al. (eds.), *Assessment and teaching of 21st century skills: Research and Applications* (pp. 3-20).

Care, E., Kim, H. (2018). Assessment of twenty-first century skills: The issue of authenticity. In P. Griffin et al. (eds.), *Assessment and teaching of 21st century skills: Research and Applications* (pp. 21-40).

Freeman, S., Eddy, S.L., McDonough, M., Smith, M.K., Okoroafor, N., Jordt, H., & Wenderoth, M.P. (2014). Active learning increases student performance in science, engineering, and mathematics. *PNAS, 111(23),* 8410-8415.

Graesser, A.C., Foltz, P.W., Rosen, Y., Shaffer, D.W., Forsyth, C., & Germany, M.L. (2018). Challenges of assessing collaborative problem solving. In P. Griffin et al. (eds.), *Assessment and teaching of 21st century skills: Research and Applications* (pp. 75-94).

Griffin, P. & Care, E. (2015). The ATC21S Method. In P. Griffin et al. (eds.), *Assessment and teaching of 21st century skills: Methods and approach* (pp. 3-36).

Griffin, P., Care, E., & McGaw, B. (2012). The changing role of education and schools. In P. Griffin et al. (eds.), *Assessment and teaching of 21st century Skills* (pp. 1-15).

Guliders, J.T.M., Bastiaens, T.J., Kirschner, P.A. (2004). A five-dimensional framework for authentic assessment. *Educational Technology Research and Development, 52(3)*, 67-86.

Hestenes, D., Wells, M., & Swackhamer, G. (1992). Force concept inventory. *The Physics Teacher, 30*, 141-158

Mazur, E., & Crouch, C. H. (2001). Peer instruction: ten years of experience and results. *American Journal of Physics, 69,* 970-977.

Nilson, L.B. (2010). *Teaching at its best: a research based resource for college instructions* (3rd ed.). John Wiley & Sons, California, USA.

Rixon, A. (2019a, May 6). Personal interview. Appendix C.

Saunder, M., Lewis, P., Thornhill, A. (2016). *Research Methods for Business Students* (7th ed.). Pearson Education Limited, Essex, England.

Sukunesan, S. (2019, May 6) Personal interview. Appendix B.

Trilling, B., & Fadel, C. (2009). *21st century skills: learning for life in our times.* John Wiley & Sons, California, USA.

United Nations. (2015). *Transforming our world: The 2030 agenda for sustainable development*. A/RES/701

Wagner, T., & Dintersmith, T. (2015). *Mot likely to succeed: preparing our kids for the innovation era*. Scribner, New York, USA.