Innovation in Education

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Article Info

Abstract

Innovation in educational systems is vital to improving the school's efficiency and productivity in the 21st century. The implementation of innovation in education will ensure that the existing educational system will produce skilled and knowledgeable students to fulfil existing and future industrial needs. However, the implementation of these concepts is still debated among scholars nowadays as it still blurs in concept, definition, and applications. Therefore, this paper tried to provide a single and suitable definition for innovation in educational purposes. It also aimed to give a slight view on the type of innovations in education, identified the differences between the concepts of innovation in education with technological advancements, and to identify the barriers for the implementation in innovation in educations. This paper will contribute to the development of the innovation concept in educational settings and advancement.

Keywords: Innovation in education, school transformation, the definition of innovation in education, type of innovation in educations, barriers to innovation.
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Introduction

The educational system as a social institution is essential to the survival and well-being of the needs of society in every nation. Education should not only be extensive, affordable, and excellent but should also be continually developing to address the demands of a quickly shifting and volatile globalized environment. (Serdyukov, 2017). The educational system needs to be designed to nurture creative and critical thinkers that focused on contributing knowledge to society. According to OECD (2010), problem-solving, knowledge building, collaboration, expert engagement, self-regulation, and the application of technologies are the learning outcomes of 21st-century education. The evolvement of the education system must be systemic, consistent, and able to measure. Lecturers, teachers, researchers, administrators, and policymakers are all required to improve the teaching and learning philosophy and practice, or other aspects involved in the process of teaching and learning to ensure that the student meets the quality of life and work.

According to Sahlberg (2009), the force that will take the global society to the future is knowledge, and innovation Ng (2009) stated that globalisation had placed a strain on education to build a creative and innovative workforce, to achieve a competitive advantage. Thus, it shifted the current focus on innovation. Globalisation has also driven education companies to deliver innovative educational goods, procedures, and market models to bid with increasingly 'savvy' global clients. Innovation involves going further from what we are doing at the moment to creating a fresh concept that lets us do our work differently. (Serdyukov, 2019). The present method of teaching did not produce students who can solve problems using knowledge when they leave schools (Maier, 1971). Education has been lax in emphasizing learning for its own sake and overlooking the importance of training in problem-solving. Breakthrough in innovation will turn the students from just using the knowledge into creating a piece of new knowledge by making them as a centre of our educational setting (Findikoglu & Ilhan, 2016).

OECD (2016) emphasised that innovation in education is vital to bring improvement in education. Innovation will improve the nation's efficiency and also outcomes in learning quality and equity. According to OECD (2016) the main problems in education nowadays, its productivity and efficiency. Efficiency calculated by the utilization of the gap of capital expended and outcomes in student success and equity. According to the OECD (2016) survey, overall spending per student in OECD countries rose by 17 percent between 2005 and 2013. However, the data collected for the Programme for International Student Assessment (PISA) from 2003 and 2012 showed no major changes in the result. The biggest problem in productivity and efficiency in education comes when the education sector compared to other industries such as the health sector. The advancement of technology impacted the health sector as much as education, but it generated an improved outcome compared to education. The recent PISA result (2018) also showed no significant improvement across all OECD countries, even though the expenditure raised more than 15% from the previous decade.

Innovation in education has been a prevalent subject of public debates but is nevertheless obscure of nature and vague in reality (Smith, 2009). According to Hare (1978), innovation in education must make a desirable and valuable change to be called innovation. Most of the time, this innovation will face disapproval from various groups of people. Innovation must be able to improve the current situation from the previous one. Innovation always based on experimentation and knowledge improvement; it is a changing process and practice. Its objective is to improve the services, product, or process quality and productivity. However, the main challenges associated with innovation in education is the lack of data (Foray & Raffo, 2014). The current study in educational innovation often focussed more on the research and development (R&D) spending and patenting or innovation data collected through surveys of firms. This measure is not enough to address the significant issues in innovation in education.

The other issue faced by innovation in education is the definition (Foray & Raffo, 2014). The goal of innovation will require different types of innovation. Innovation is not a linear process; instead, it a complex product consisted of many players such as the researchers, teachers, educational institutions, government, or other stakeholders. According to Popescu and Crenicean (2012), the idea of innovation was discussed, developed, and defined from the viewpoint of various academic fields, such as anthropology, economics, psychology, management, linguistics, cognitive science, philosophy, and many other fields. This makes a single definition of innovation in education did not exist nowadays. According to Foray and Raffo (2014), the difficulty of defining innovation is because it was challenging to describe and measure innovation when the objectives and activities involve are not define accurately. Therefore, the objectives of this paper are to define the

innovation in education, identified types of innovations in education, and the barriers to implement it in education.

Definition of Innovation in Education

The discussion on the definition of innovation sometimes mixed with the concept of the invention, change, and reformation in education. Some scholars also define innovation in education as a process, and some even explain it according to innovation theories in business development. These various definitions of innovation in education are very confusing when we try to discuss innovation in education. The most well-known definition of innovation in education nowadays came from the Oslo Manual (OECD/Eurostat, 2005). Innovation defined as the realization of new or enhanced products, services, products, marketing strategies, or new organisational strategies, external relations, or workplace organisation. According to OECD (2016), this definition can be applied in the educational sector with a small modification. Thus, OECD (2016) defined innovation in education as the introduction of an improved or new process, products, services, new ways of managing activities, or new marketing approaches. However, according to a few scholars in education, this definition of innovation cannot adequately describe innovation in education.

OECD (2016) also differentiate innovation from reformation and change. Innovation is defined as the execution of new and better ideas, practices, and bits of knowledge. In contrast, reformation organized and attentive process in delivering changes. Therefore, change is the transformation or modification that could be planned or unintentionally phenomenon. King and Anderson (1995) define changes in organisation and innovation differs from its perspective. Organisational change usually happens at the macro-level, is concerned with the transformation of organisational as a whole along with its major subsystems than with small workgroups and individuals. Whereas, innovation usually concerned a localised impact on the organisation. Pratte (1974) said the change is necessary for innovation but is not a condition for innovation.

Pratte (1974) said that the term 'educational innovation' is sometimes mixed, sometimes it understands as describe and evaluate, and sometimes it implies improvement. According to Mykhailyshyn et al. (2018), the definition of educational innovation differs from innovations in educations. Innovation in education has a broader definition than educational innovation. The definition includes educational, social, scientific and technological, economics, administrative, and other innovations. The scientific and technological innovation is a result of the R&D of the intellectual property that transferred for implementation and application. Meanwhile, social innovation consists of social supports for students and teachers. However, educational innovation can de define as the methods or procedures in the educational activities that vary from the prior practices, and its objective is to improve educational efficiency in a competitive environment. Educational innovation consists of the scientific and methodological, technological or pedagogical innovation. Innovation is not merely an invention (Smith, 2009). Instead, it is a cycle that consists of several stages and the collaboration of many stakeholders. Most scholars agree that innovation must produce an improved result to be called innovation (Mykhailyshyn et al., 2018; Sedukyov, 2017; Smith, 2009; Ng, 2009; Hare,1978). Smith (2009) define innovation in education as a new product, new process, new ideas that are shifting the way people view an issue or question by redefining our sense of what is possible, and innovation at the platform level. Innovation at the platform level mentioned here is the shared conceptual architecture consisted of the frameworks, set of definitions, standard and protocols that provided an infrastructure into which modular

components connected—innovation at the platform level also mentioned by Ng (2009) and Wai (2017). According to Ng (2009), school is an organisation that acted as a platform for innovation. Wai (2017) mentioned that 'platform' as a place where people gather in a group to create something or develop new ideas or products.

Smith (2006) mentioned that the definition of innovation gets confused when scholars try to define innovation according to the seminal work of Rogers (1971) in Diffusions of innovation and the definition given by the Organization for Economic Cooperation and Development (OECD). Rogers defines innovation as an idea, object, or practice that perceived as new by a person or the unit adopted it. However, according to Smith (2006), this explanation was too general and inclusive. The words of practice, an idea or an object does not define the innovation much in the idea of perceived by newness for adoption. Hagreaves (OECD) defines innovation as individual creativity and creative thinking to solve the existing problems differently and theoretically better ways, far from the original methods. This definition had shed some light on innovation definition by mentioning about change, new and better outcomes and the most important thing is the successful idea or practices, but still not enough in the field of education. Therefore, according to Smith (2006), the definition of innovation in education must be an emphasis on the process of innovation. In relation to the incorporation of innovative technologies, approaches, or resources into instructional action, innovation must be permitted to be evaluated. It will create a firm ground for policymakers, students, teachers, educationalists, and other stakeholders that can influence the directions of education. Innovation always has to be associated with the idea of playing in new ideas. It will provide some space for practitioners to evaluate and reflect on their existing methods in teaching and learning and decided if innovation needed.

Innovation is a process of organizing and sustaining the combination of concepts, actors, and practices to address specific problems (Smith, 2006). According to Smith (2006), there are five interrelated moments together with this concept, which are; 1) innovation as a process, it is different from invention; 2) the process is both dynamic and social at the same time, it involves the discussion to recruiting new entrants thus retaining the current players in the innovation sector; 3) the basic concepts for innovation are ideas, players and practices together in a novel way; 4) the main objectives are to address the problems, issues or crisis that arise; 5) since it is only targeted at specific problems, it is mostly subjective in its novelty. The new alignment of practices, ideas, and players are only treated as a novel in a specific location, time, and context. Steven (2009) addresses that the innovation process must involve five steps, called the innovation cycle. This cycle consisted of clear about the problems or issue that need to be solved, idea generation based on experiences and situation to solve the problems, this idea then had to be refined and tested, provide and share the evidence and facts, and there is always allowed for feedback to enable the continuous improvement in that particular innovations. According to Wai (2017), this innovation 'platform' and 'process' must be aligned with the existing innovative teaching and learning in the classroom, and also must have impressive networking to produce a massive impact in education.

The other definition of innovation in education is as a concept (Findikoglu & Ilhan, 2016). According to them, innovation is a concept that connected societies and future economics. It is a way of finding the best alternative ways of changing individual behaviours in the individual when the existing ways such as learning theories, learning tasks, teaching methods, and learning approaches are not working effectively. According to Collingwood (2006), the installation of innovation is not merely a mechanical process, but it also a developmental process. It altered not just the innovation but also the accepting system. The innovation planning in the educational

system is the management process that consists of the attributes to innovations, surroundings where the implementation of innovation happens, and the features of the potential users. Forray and Raffo (2014) used 'innovation deficit' to define the innovation in education. According to Forray and Raffo (2014), innovation in education is a general trend of decline in the delivery of education facilities either in primary or secondary schools, however, the aims or goals the scheme sought to accomplish.

Innovation viewed as a successful implementation of new things or methods (Brewer & Tierney, 2012). Serdyukov (2017) stated that innovation in education could appear as a new methodological approach, new pedagogical philosophy instructional tools, teaching techniques, learning processes, or instructional structures that when executed will bring major improvements in the process of teaching and learning, and indirectly improved students learning. The main concern in innovation in education is to increase the efficiency and productivity of the learning process to improve educational quality. This vision of innovation is the same as the definition given by OECD (2016). At the same time, the main focus of innovation is to raised efficiency and maximise the quality of education received by every student. Thus, the efficiency in education generally measured by the amount of time spent, resources, and cost of money involved to achieve the targeted results (Serdyukov, 2017). If we can achieve the result with less amount of time, less money involved and overall, less effort put into it. Then productivity will increase.

As mentioned above, we can summarise the approach of the definition of innovation in education into; a) innovation in education is the introduction or implementation of new products, new processes, new approaches, new methods, new administration approach, or anything new introduced in educational areas that brings a massive impact of improvement in producing quality students; b) the introduced innovation must be good enough to minimise the time, budget and resources spending to obtain the desired results; c) the innovation must be accepted and supported by all stakeholders in the educational system; the learners, teachers, parents, researchers, educational administrators, policymakers or communities. This definition does not define innovation in process, product, or concept, as mentioned above, because innovation happened in every stage of education. Thus, innovation can be characterized by its concept, stages in which the innovation occur - whether in ideation stage or implementation stages, or through the level of innovation occurred (either in a small group of teachers or at the administration level), or type of innovation either it is disruptive, incremental or radical.

Innovation and Technologies

Technology is the main driver for innovation to happen (Serdyukov, 2017; OECD; 2016; Ng, 2009). Many articles discussed innovation in the views of technologies. Findikoglu and Ilhan (2016) stated that innovation does not necessarily mean the adoption of the latest technology. According to them, innovation and technology adoption are two different terms that interchangeably. Thus, innovation in education viewed as the use of the technology itself. According to Serdyukov (2017), innovation is not merely about adopting the latest technologies. It must be accepted as a process to deliver engaging learning to students through the use of technology. Using only ICTs in teaching and learning is not entirely mean innovation and it is not the primary goal in education (Findikoglu & Ilhan, 2016). It will facilitate the learning processes or make the structure of the conveyed content to students much more presentable and easier to understand, and it surely will save more time and resources compared to the traditional way. It

will give teachers more time to plan other activities in the classroom for revisions and enforcement.

Seymour (1999) said that the introduction of computers in education in the early 90s would make significant changes in schools' performance. However, the educational system still not progress much. The OECD (2016) report also agrees with this statement even after seventeen years later. According to OECD (2016) report, the adoption of new technology in schools has not achieved the required outcome at a lower rate. There no significant improvement in mathematics and literacy achievement using the advancement of ICTs across the majority of OECD countries, although the differences in national revenue and socio-economic standing have been taken into considerations. This weak performance is due to the schools and educational system not yet identified the technologies potential, the restricted abilities of students and teachers, the difficulty in identifying quality and useful software and resources, learning goals is unclearly defined, and lack of preparation on how to incorporate technologies into teaching and learning process and learning process. Serdyukov (2017) argues that when the planning focused more on the technology, we may miss out on the leading player in the process, which are the teachers and learners.

The problems of educational technology in innovation are twofold (Serdyukov, 2017). First, any incorporation of technologies in the phase of teaching and learning is intended to improve the efficiency of teaching and learning. However, it can only be achieved if the effective pedagogical theories used as a basic foundation for these implementations. Second, the implementation of technological innovation will surely make changes and drive pedagogical innovations. However, this will happen at a slower rate, challenging, and sometimes will arise more financial, human resources, or technical waste before it can achieve the ultimate success. Educators must be aware that computers are not a substitute for humans. It is just an extension of human abilities. Thus, the implementation of technological innovation must go hand in hand with the existing leadership, pedagogical theories, and research in education. OECD (2016) stated that even digital technologies could not transform education, but it still has a substantial potential impact on the learning and teaching process in schools and can open up a new perspective in teaching and learning processes. The integration of new modern approaches is the most prominent challenges compare to technological barriers.

These advancements of technologies that drive innovation in education do not come with only a positive impact on education. Sousa (2014) stated that the users of the technology widely would have both negative and positive impacts on student's memory systems and attention. Maurer et al. (2013) also mentioned that the introduction of the modern media in education, particularly computers would endanger the thinking capacity, to remember clearly, to write or read with concentration because all these activities required creativity. Grant et al. (2012), in his book "Who Killed Creativity?" mentioned that the new technology would surely promise us with faster communications technology and faster response time expected, but it will distract us from opportunities for creative thinking. The are many side effects discussed on the technology enhancement in education involving the social, culture, and psychology. One of the apparent effects is the promise of unrealistic hopes in technologies to solved every teaching and learning problem in education. This effect will lead to weakening the student's and teacher's efforts and, without realise had taken the teachers out of the process (Serdyukov, 2017).

Serdyukov (2017) also enlisted many factors that concern online learning even though its accessibility, convenience, comfortable learning surrounding which is anywhere, the study schedules are very flexible, had made it a popular choice for students nowadays. However,

according to Serdyukov (2017), online learning had restricted students' interactions with teachers and indirectly permitted a little live cooperation and opportunities for relationship existed when doing it in a study group. These interactions are essential for the student's development. Online learning also demanded a student be well developed, had their critical thinking, developed reading, and writing skills had technological skills on doing their research along with the higher self-efficacy, motivation, and perseverance that majority. Almost all of the younger students do not possess these qualities yet. Thus, innovative technologies seem to bring enhancements to improve in some areas, but it still not the only way to improve the existing educational systems' efficiency and productivity.

Type of Innovations in Education

OECD (2016) listed four types of innovation in education based on the Oslo Manual. According to the Oslo Manual, innovation can be categorized into four types, which are process, products, organisational, and marketing innovation. Product innovation is the execution of services or goods in education that improved from its original characteristics or use. It includes the major changes in materials and parts, product features, user-friendliness, existing software, and other functions. Process innovation is the execution of the new or substantially better delivery services or products that incorporated major changes in software, types of equipment, or techniques. Meanwhile, innovation in marketing is the new marketing approach that emphasizes the changes in product design, product placement, product packaging, product pricing, or promotion. Organisational innovation is the introduction of new organisational approaches or strategies in business, workplace structure, or its relationship to other organizations. Based on these, OECD (2016) modified the existing definition to match educational settings. According to OECD (2016), innovation in education can be categorized into four types which are; 1) introduction of new services or products such as new curriculum, educational resources or textbooks; 2) introduction of a new process in delivery the services such as the use of technologies in e-learning activities; 3) introduction of new approaches in activities organization such as the use of ICTs to interact with parents and students; 4) introduction of new marketing techniques such as the cost for each course in university.

Some of the educational scholars define the type of innovation based on innovation theories. Smith (2009) stated that there are two types of innovation in education that are disruptive and sustaining. Disruptive innovations are the innovations that out from the box; it is a different practice to serve a group of people. It creates new structures, ecosystems, and architecture to the old practices. Sustaining innovations are innovations that bring improvement to the existing product, process, or services. According to Wai (2017), innovation in education must have the characteristics of sustaining innovation and also disruptive innovation at once. Therefore, a fundamental change and drastic improvement will happen in the old educational system. Popescu and Crenicean (2012) said that innovations in education are technical innovation, conceptual innovation, and relational innovation. Technical innovations include the use of various new technologies in education; conceptual innovations are the introduction of new courses, new educational methodology, or new educational programs; relational innovation is the better way of establishing and communication interactions inside or outside educational institutions. Serdyukov (2017) said that innovation in education could be categorized as either disruptive, revolutionary, evolutionary, or sustaining. Evolutionary innovation will lead to continuous incremental changes. The revolutionary innovations will change the system completely, restoring

the outdated systems with a better one within a limited time. Meanwhile, the sustaining innovation linked to the achievement, such as the continuous enhancement in the instructional. The disrupting innovation will change the whole system, such as a national curriculum reformation. Innovation also can be treated as tangible as technological resources or intangible in approaches, methods, or techniques. Serdyukov (2017) explained further that evolutionary innovations in education consisted of the introduction of new multimedia materials, new mnemonic techniques, more efficient teaching strategies, the introduction of few learning strategies such as case study, inquiry-based, problem-solving, small group discussion or collaboration. Meanwhile, the application of educational technology in education can sometimes be evolutionary and sustaining at the same time because it is only involved in a minor change in certain aspects of learning. The transformation or reformation of the educational system and online learning always in revolutionary innovations as it will completely change the whole system.

According to Mykhailyshyn et al. (2018), there are three types of innovation in the internal environment of education which are the educational innovation, administrative or managerial innovation, and ideological innovation. Educational innovations are the innovation that happens in teaching methodologies, the curriculum content, high professionalism of the teaching staff, organisational and methodological support of the educational process. Administrative or managerial innovations are the support given to educational institutions structures, management at the subdivisions such as faculties or departments, general management systems, and its' structures, or the delivery system of the educational services quality. Meanwhile, ideological innovations are the participation of educational institutions in specific programs, events, or competitions held by the government and the ministry of education.

All the discussions above lead to the perspectives of the own scholars to define the type of innovations according to what they believed. However, innovation in education defines before is the new product, process, methodology, or anything new that brings significant changes to the educational system. These changes can happen either in incremental, radical, evolutionary, revolutionary, sustaining, or disruptive. It also can happen in every level of educational institution either in a small group of educational, department or faculty levels, administration, organization, or at a national level. It was just not right to restricted the innovations in education at specific types of innovation as it will constrain the characteristics of the innovation itself.

Barriers to Innovation in Education

The main characteristics of innovation are to bring new changes to the old one. Sometimes changes are good for the organisation or group of people, but sometimes it had the other negative impacts on the system. Therefore, to introduce an innovation in the old and rigid system, especially in the educational system, innovation sometimes expresses disapproval (Pratte, 1974). The biggest barrier to the implementation of innovation in education is both the students and teachers because they will face the changes directly (Maier, 1971). According to Hare (1978), these disapprovals may come when the innovation makes radical changes, but there are no significant results or outcomes from the innovation. The evaluation of the innovation must come first before the implementation. All the stakeholders must have given the result of the assessment; therefore, they can make a judgment if either they want to accept or to reject the new changes. In contrast, that is not what happens in the reality of the implementation of the innovation.

The old and traditional structures of the educational system are the significant barriers to innovation in education to happen. Higher educational institutions have been proven to be slower to adopt innovations (Hoffman & Holzhuter, 2012) due to its complexity and labour intensive (Brewer & Tierney, 2012). Higher education was difficult to be more productive. The secondary schools are more traditional and conservative compare to the universities (Gibbons & Silva, 2011). This is due to the role of the secondary schools, which are to ensure the student's safety and well-being in preparations for their life after they graduated. Innovation is difficult to introduce in the school system because it disrupts the usual routines and pressure the implementers to move from their comfort zone (Serdyukov, 2017). Usually, teachers and administrators wary of the threatening changes in schools and have little tolerance for changes.

According to Smith (2009), barriers to innovation are lie in the traditional political and structural arrangements in education, the market dynamics that unsupportive to innovation, and the broken R&D cycle in education. The lack of clarity on the problems to be solved, ideological disagreement between the purpose and role of public education, states' rights, and parent rights creates confusion among the policymakers and inhibits innovations. Innovations are rarely translated into policy changes in education and a little support by the governance makes it harder to implement. In market dynamics and incentives to promote innovation, there are large companies that monopoly the whole market. The smaller companies might not survive even though they produce excellent and impactful innovations. Schools or educational institutions are well known with a restrictive budget and financial planning; to introduce technology to the educational system is hard if the maintenance or upgrades not come hand in hand. Teachers may reject the adoption of technology that may be obsolete over time. The teaching professions, school leadership, and educational administration are set up for licensure and promotion. Thus, no incentives are given for attempting an innovative practice to produce an improved student's outcomes.

Smith (2009) also mentioned that the broken of R&D cycle in education that leads to disconnecting across practices, research, development, and investment would inhibit the ability of innovation creation and measurement. The weak knowledge base to identify the needs in student's achievement and how to organizing and education to encourage innovation is weak. Research in education is split from problems and practice. The research that carries out in government or universities is isolated from schools, focusing more on the incentives rather than solving the real problems in the schools. There are little initiatives from the government to brings innovations to schools. The practitioners, teachers, and administrators failed to translate the pressure to improve quality, practices, instructional, and technological advancement in education to innovations (Foray & Raffo, 2014). Instead, practitioners respond by trying to change the structure of the educational system. This will not change educational practices. Elmore (2002) argues that schools and people are trying harder to change to educational structures and that leave the innovations in the instructional practice untouched. Any structural and organisational changes lead to a new pattern, and it will lead to resistance as actively as the original innovation might be.

6.0 Conclusions

Innovations in education can only transform the educational system if there are widely accepted by the students, teachers, administrators, communities, and any stakeholders related to the educational system. The introduction of the innovation must have a significant impact on the educational system or achieved its objectives. It is not only applied to educational technology innovations but also various types of other innovations. Innovation generates such a powerful impact on promising a newer, better, and improved educational system for a better future. Finland, Singapore, China, and Hong Kong are the example of the few countries that make innovation as their core transformation and succeed in achieving a higher result in student's performance. However, they faced many challenges in the early stage of implementation.

The professional culture that supports innovations in schools, teacher's reflection and meaningful discourse of the new teaching practices had proven to produce higher levels of innovative teaching practices (UNESCO, 2013). Schools, teachers, administrators, and students must be given alternatives and time to adopt or reject the introduction of the innovations in the schools. Innovations that arise from the needs of the schools in their context will produce a better result than the enforcement of an outside innovation (Lavelle, 1984). Teachers and students need to be the centre of these innovations. Teachers need to be reflective of his/her teaching and come out with innovative solutions to solve the problems in their classroom. This indirectly will empower the teachers and improve their learning quality. The educational system must be brave enough to give teachers more autonomy to define their teaching and learning process. All these must be supported by the school leadership, culture, administration, parents, communities, and also governments.

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