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Innovative Learning Era Industrial Revolution 4.0 In Optimizing 21st Century Competence Elementary School Students

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Abstract

This study aims to describe the design of innovation learning in the era of industrial revolution 4.0 that can optimize 21st century skills for elementary school students. The research method used is a qualitative descriptive literature study. Data collection techniques are carried out by studying various references such as proceeding articles, journals, books and other supporting sources. The data that has been obtained is then analyzed by analysis content. The results showed that the design of innovation learning era industrial revolution 4.0 In optimizing the competence of the 21st century for elementary school students is to consider four important things, namely the characteristics of elementary school students as a generation of the 21st century; Profile of 21st century teachers; the characteristics of 21st century learning itself; and consider active learning models that can develop students' creativity. Characteristics of elementary school students include; fluent in technology, multitasking, active, playing, imagining, singing, and group fun—the appearance of teachers of the 21st century can be adaptive with the technology, bewitch, creative, and compassionate. Characteristics of 21st century learning include; integrate ICT, HOTS, 4C, character, and literacy in the learning process. The active learning model is project-based learning and problem-based learning. Furthermore, researchers offered the learning design to be packaged into interactive media using the sac application (Smart App Creator). SAC is one of the applications that can be used to design more interesting and interactive learning. so, it is suitable for elementary school students.

Keywords:

Innovative learning, Industrial Revolution Era 4.0, 21st century competence, elementary school students

1. Introduction

The Indonesian facing the Industrial Revolution-era 4.0. It characterized by the development of fast-paced and online all-around technology. The development of such technology will undoubtedly have a profound impact on various aspects of life, both positive impact and negative impact. Positively the development of technology can make it easier for us to do activities while giving new job opportunities for the millennial generation. But on the other side with the development of this technology will change all the order in the life of people both political order, economical to education.

Various impacts, such as a new challenge for education. Education required to prepare a generation that has complete competence to survive life and life while being able to compete in the global world. Making the ages have full power, takes a quality education, especially in the learning system. It is essential considering the learning process is the realization of a document written curriculum organized by the teacher in class.

To be recognized, that our learning practices in the field, especially in elementary school in quality, are still far from expectation. The learning system emphasizes memorizing knowledge in the bank's style, where the student as a piggy and teacher is the founder (Paulo Freire, 2008). These have supported the results of the Al-Tabany (2015) study, which empirically posited that the learning process is conventional and is likely to be teacher-centered so that students become passive. Besides, most of the teachers in teaching have not utilized technology as a learning medium. As the

results of research on Aminah revealed, teachers had not optimized technology as a learning medium due to the limited facilities and infrastructure, so the teachers have less encouragement to create with technology (Neneng Aminah, 2019).

Such a learning system will undoubtedly affect the quality of education graduates and have not been able to answer the challenges of the age, and lack of complete and competent competence in their fields such as; Less good at communicating both orally and in writing; Less critical in thinking and has not been able to cope with his problems. Similarly, the work is mechanical, not creative, low work ethic, individualist, less proficient in using technology and a weak leadership attitude (Kirana Prama Dewi, 2019). Meanwhile, Ali ibn Abi Talib once ordered "students and prepare your child for a time that is not your own." Ali's message can have understood that the education system must be continuously changing and adapting to the present and future needs.

For that, in preparing generations according to his time, teachers should be able to blossom tamarphosis (Iriyanto, 2012). i.e., willing to change from the time of duty and always innovate in teaching. Teachers are as agents of positive change for students, so in education, teachers should be able to participate in evolving modifications. They should not be allergic to learning with a new paradigm. If the teacher in the teaching still uses traditional and conventional ways is feared to be left by the students due to the learning system is presented less attractive.

Various phenomena that occur in the learning system in elementary school should be a serious concern because elementary school is the first essential placement for the succeeding generations. High quality and absence in advanced school is very dependently on the primary school quality. One of the efforts that can have done is to implement innovative learning. It is essential and urgent to do to prepare the digital generation to have the competence of the 21st century so that it still survives in living life and life and able to compete in the global world. Based on the above analysis, the question that can be asked in this study is how is the design of innovation learning in the era of industrial revolution 4.0 effective in optimizing 21st century skills for elementary school students?

2. Literature Review

2.1. Learning Innovation

Innovative is a new idea or technique that is an adjective of innovation means renewal, in view of the verb innovate, is meant to introduce new things to make progress (Santayasa, 2018). Innovation is also defined as an idea, an idea that is accepted as a new thing by a group or group to adopt. Innovation is generally used by an institution or country for an economic policy in the field of production in new ways. Kristiawan & Rahmat (2018) defines innovation of an activity in research for development in the application of existing science and technology into a product or its production process. Innovation has a connection with learning, it can be interpreted that learning innovation is an idea developed in new ways that are different from the previous learning system to achieve educational goals.

Rogers (2003) presented, in making innovations need to pay attention to several things, among others; first, characteristics that include benefiting the recipient, in accordance with norms and needs, easy to understand and testable, observable. Second, diffusion is the process of communicating the results of innovation in a particular group. In this diffusion there are several elements, namely; there are innovations or new ideas, there are communication channels, dimensions of time. Third, the implementation stage includes; knowledge of innovation, persuasion or acceptance of innovation, implementation and confirmation as reinforcement to receive innovation. When depicted in the form of a chart can be seen the stages of innovation as follows:

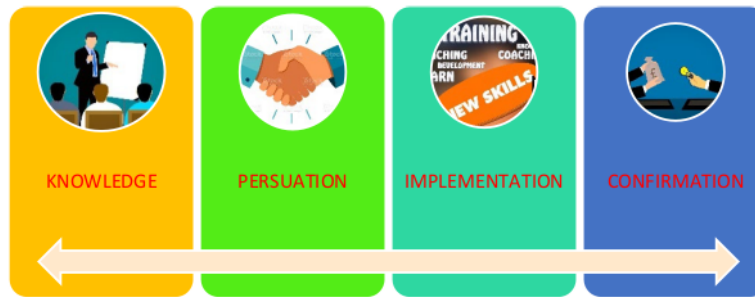


Figure 1. Illustration of innovation implementation stages

2.2. The meaning of Industrial Revolution Era 4.0

The era of the 4.0 Industrial Revolution is a continuation of the development of the previous industrial revolution. Where each event has its gradual characteristic, Asakdiyah explained that the era of the 4.0 Industrial Revolution is an automation and data exchange that has considered to be the most current today, characterized by the presence of fast-paced and online technology (Slamatun Asakdiyah, 2019). Similarly, Muchlas conveyed, that the era of the 4.0 Industrial Revolution is a manufacturing revolution technology that has initially carried out manually shifted to automation so that all products that touch the Hajj and human life have executed with a smart factory approach that includes; Cognitive machine, Internet of things, cyber-physical system, cloud computing (Muchlas, 2019). In accordance with the above two opinions, Dadang said that the core of the 4.0 Industrial Revolution is Internet use and digitalization (Dadang, 2019).

Based on the three explanations above, it can have understood that the 4.0 Industrial Revolution is an all-around, technologically-paced, online digitization that is in its rework done by human-changing machines. Shows that technology and science are continually evolving and dynamic to improve the previous industrial revolution. Thus, the Industrial Revolution of 4.0, can be said not to stand alone, but intertwined with the development of the last revolution.

2.3. 21st Century Competence

According to Trilling and Fadel, the 21st century competency should have held with the participant of Didik; First, learning and innovation skills (living and Career) cover; Critical Have and problem login solving, communication and collaboration, creativity and innovation. Second, information, media, and technology skills (technology and media skills) covering; Literacy information, media literacy, and ICT literacy. The third is life and career skills that include; Flexibility and adaptability, initiative and self-direction skills, and social and cross-cultural skills (Bernie Trilling and Charles Fade, 2009).

Care also conveys the same opinion. According to the 21st century competencies that students need to have in great lines, there are four competencies; first, way of thinking includes; Creativity and innovation, critical thinking, problem-solving, decision making, learning to learn, metacognition. Secondly, ways of working include; Communication, Collaboration (teamwork). Third, tools for working include; Information literacy and ICT literacy. Fourth, living in the world includes; Citizenship-Local and global, life and career, personal and social responsibility-including cultural awareness and competence (Patrick Griffin • Barry McGaw • Esther Care,2012) The Partnership for 21st century learning or P21, an organization in America, identifies the 21st century competence of the 4C, including Critical thinking, Creativity, Communication, and Collaboration. Meanwhile, Ananiadou and Claro conveys that the 21st Century learning dimension is three; Information, communication, ethics, and social influence (K Ananiadou and M Claro,2009).

Based on the 21st century competence expressed by the experts above, this article refers to the 21st century skill posed by the Partnership for 21st century learning or P21, which includes Critical thinking, Creativity, Communication, and

Collaboration. The capability has chosen because the authors assess more comprehensive and easily applied in the learning process.

The four competencies in the development have tailored to the 21st Century learning system, which seeks to activate and develop students' creativity by using unlimited learning resources. So that students are more freely digging for information anywhere, anytime, and with anyone so that the learning process is carried out continuously throughout life.

Wijaya, Sudamulet, and Nyoto explained that P21 (Partnership for 21st Century Learning) had developed a 21st century learning framework. Where this framework requires learners to have some skill, that is; Technology, media and information, learning and innovation, and life skills. The 21st century has four features: information, computing, automation, and communication. The 21st century characteristic has encouraged the shift in community learning methods to anticipate the needs of the 21st century (Etistika Yuni Wijaya, Dwi Agus Sudjimat, and Amat Nyoto, 2016). Where these changes can be seen in the following table:

Table 1. 21st Century Learning Paradigm Change

| 21 st Century characteristics | Learning methods |
|---|---|
| The information available anywhere and anytime. | Students find out not notified. |
| Computing (faster using machines) | Formulating a problem (Menanya) instead of just resolving the problem (answering) |
| Automation (reaching all jobs) | Analytical thinking/decision making, not mechanistic thinking (routine) |
| Communication (from anywhere to anywhere) | Cooperating and collaborating on about issues |

21st Century Learning has four principles of learning; Learning to focus on students and teachers acting as facilitators, collaborating with their classmates, is contextual close to the students' daily lives and engages them with their social environment so that when students plunge into a non-alien community with their environment (Jennifer Rita Nichols, 2020).

2.4. Learning innovation of the 21st century

Along with the rapid development of technology, has given a significant change in the learning of the 21st century. This is due to the ease of access to digital learning resources in meeting the needs of students who certainly demand more interaction between campaigns with each other such as teachers, learning design, learning resources, learning strategies including student activity.

The role of teachers in 21st century learning is no longer the main source of learning, but rather as a facilitator of mediators and motivators. Because the source of learning in the 21st century is wider and flexible. Students can learn anywhere with anyone and anytime. Therefore, in designing 21st century learning not only pay attention to learners in terms of different needs, interests and abilities, but also pay attention to the learning style of learners that suits the characteristics of the 21st century generation.

Related to this, Endang Komara (2018) said in designing 21st century learning there are three important things to note, namely; First, in the design of learning should be arranged in detail and able to explain everything that will happen in the classroom including the assessment process and achievement targets both national curriculum achievements and skills of the 21st century. Second, include elements of higher order thinking skill (HOTS) by giving assignments to students who are applicative, analysis, evaluative, and creative. Third, applying varied, constructive and meaningful learning models such as problem based learning, cooperative learning and inquiry learning. Meanwhile, Regulation of the minister of research and technology higher education number 44 of 2015 suggests that the 21st century learning model that can effectively facilitate the fulfillment of learning achievements, among others; group discussions,

simulations, case studies, collaborative learning, cooperative learning, project-based learning, problem-based learning (Muhali, 2019).

In line with his opinion Endang Komara, Estu Miyarso (2019) in detail explained that in the design of 21st century learning it is important to pay attention to some characteristics, among others; first, the collaboration of students and teachers, where this collaboration has been presented in the campaign objectives, learning strategies and steps of learning activities contained in lesson plan. Second, HOTS-oriented campaigns are featured on indicators, objectives, learning and assessment measures. Third, integrate technology and information (ICT) that is immersed in the goal campaign, learning steps, media selection and or learning resources. Fourth, it is oriented towards learning skills and developing 21st century skills that are applied to learning activities. Fifth, develop literacy that is applied to learning activities. Sixth, strengthening character education (PPK) conducted systemically starting from preliminary activities, core activities and closing activities to assessment.

2.5. Elementary school students' characteristics

Elementary school students are a generation of gold that lives in the digital age or as a generation Z. Digital generation is a multi-talented generation who is very familiar with the technology with a feature among others; Fluent technology, social, communication intense, and multitasking (Satrianawati, 2012). There are some characteristics of elementary school students' development that need to be known by teachers. It is essential so that teachers can determine the strategies and learning methods that correspond to the students' characteristics.

Physically motor, the characteristics of elementary school students age 7-12 divided two It namely fine motor and coarse motor. The rough motor phase of elementary school students can write, type, draw, make crafts of clay and paper, sewing. Elementary school students can line lines, martial arts, gymnastics, swim, athletic football play for the first motor phases (Yusuf Suryana Irwanto, 2016).

Hurlock conveyed that elementary school-age children were physically active; Aware of body health; Love to hang out; Role playing; The skilled CALISTUNG; Develop everyday concepts; Self-catering Accommodation Socializing and a high sense of curiosity (Elizabet B. Hulock, tt). Similarly, Yusrianti address that the characteristics of elementary school children are physically active like playing fun; Happy moves; Happy working in groups; Happy to feel or do directly also given everything is still concrete (Susi Yusrianti, 2014).

According to Piaget, as quoted by Mu'min, cognitive, elementary school-age children 7-12 years are at the concrete operational level. At this age has been able to develop a logical mind and began to understand the operation of several concepts (Siti Aisyah Mu'min, 2013). This age child can also sort objects by size, classify, consider some aspects of a problem, start to understand the objects can be changed and understand the quantity, length and number of purposes, and disappearance of Egocentrism (Masganti SIT, 2012).

Based on the above characteristics, it indirectly affects the learning system held. Where in the process is adapted to the characteristics of the 21st century generation which is certainly different from the previous generation. Where generation z requires activity-oriented learning process, requires a contextual learning environment, integrates technology into the classroom and uses broad and flexible learning resources such as school environment, community, internet, library, and so on.

3. Methods

This research is a type of qualitative research with library research. The data sources in this study were obtained from various references that examined the learning innovations of revolution 4.0, the characteristics of the 21st century generation and the competence of the 21st century. From this study is expected to get an idea of how the design of learning era industrial revolution 4.0 for elementary school students including what strategies are appropriately used in optimizing the competence of the 21st century for elementary school students. The references referred to include; journals, books, proceedings and other sources that support. The technique of data collection in the research literature study has conducted in four steps; Preparing equipment; Records of materials as a primary source; Regulate time in information collection; Read and make research notes (Khatibah, 2011).

First, prepare the equipment. In this case, researchers have developed pencils, paper, and laptops. The tool used to record the various information found in the study material; Second, noting the content as the primary source. In this case, it is a reading material directly related to the theme of the study; Third, set the time in information collection. In this study, the information gathering was conducted for six months since the survey has undertaken, where the study started in November 2019 to April 2020; and fourth, read and make research notes. With the amount of information obtained, it has done recording so that the information has systematically arranged. Further information that has been collected, carried out data reduction using selecting data that is suitable for research purposes. The Data that has reduced analyzed in a descriptive, critical and synthesis.

4. Results and Discussion

Based on literature studies, several important notes can be presented in designing innovation learning in the era of industrial revolution 4.0 in elementary schools, namely; 1) adapted to the characteristics of elementary school students; 2) consider the learning characteristics of 21st century innovation; 3) consider an active learning model. This is important so that efforts to optimize the competence of 21st century elementary school students can be achieved. The following is an explanation of the three considerations above.

4.1. Pay attention to the characteristics of elementary school students

Primary school students are the 21st century generation or also called generation Z. The 21st century generation has different characteristics to the previous generation. Satrianawati (2017) suggests that the 21st century generation or generation z has the eloquent characteristics of technology, social, intense of communicating and multitasking. In the face of the characteristics of the 21st century generation, teachers should orient on the development of 21st century skills, literacy, high-order thinking skills (HOTS) integrated into the learning process, taking into account the methods and media to be used and considering the management of the classroom, it is essential to do so that the skills of the 21st century are truly achieved. Triana, et.al. (Iriawan and Saefudin, 2021) said that in the face of the 21st century generation, a teacher who has a profile of 21st century teachers among them; can be adaptive with technology, bewitch, creative, and compassionate.

In general, elementary school students' characteristics like to sing, love to move, love to imagine, love to group, think concretely, and like praise. In this case, teachers are expected to be able to develop learning that is in accordance with the characteristic of elementary school students containing elements of games, groups, experiential learning by creating a safe and comfortable learning nuance for students such as; 1) want to hear; 2) avoid physical or non-physical violence; 3) be a source of inspiration, patience, and wisdom. (Iriawan and Saefudin, 2021). To get the point, let's look at the picture; the characteristics of elementary school students have summarized in figure 2

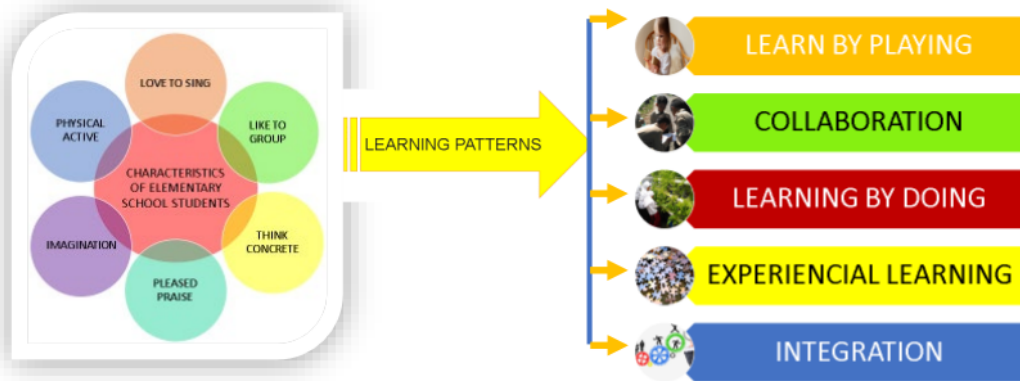


Figure 2. Characteristics of Elementary School Students and learning Patterns

4.2. Considering the Characteristics of 21st century learning

The phenomenon of 21st century learning in the era of industrial revolution 4.0 has brought a new change in the learning system, one of which is the change in access to digital learning resources to meet students' needs. In the face of these changes, teachers' presence is indispensable in ensuring the occurrence of meaningful learning processes, character, and developing the skills of the 21st century. Necessary 21st century skills developed according to Sulisworo (2019:8), citing the Partnership for 21st century learning or P21 an organization in America include; Critical thinking, Creativity, Communication, and Collaboration.

For the skills of the 21st century to be achieved optimally, the innovation learning of the industrial revolution era 4.0 in elementary school referring to the characteristics of elementary school students as the 21st century generation and the learning characteristics of the 21st century itself. The following is an overview of the steps of innovation learning design in the era of industrial revolution 4.0 in optimizing the competence of the 21st century for elementary school students.

4.2.1. Students and teacher collaboration

This collaboration between students and teachers shows that the learning paradigm of the 21st century has shifted from teacher-centered to learner-centered. Teachers are no longer the only source of learning but multi-resource learning. Students can dig up information through big data. The role of teachers in 21st century learning includes; facilitators, mediators, and motivators. In the design of learning tools, a collaboration between teachers and students has already been demonstrated when teachers design learning objectives and have reflected in learning steps.

4.2.2. Higher Order Thinking Skills (HOTS) Orientation

HOTS in learning planning, already shown in indicator campaigns, objectives, learning steps and assessments. HOTS referred to here is high level thinking. As Conklin (Arifin, 2017) explains that HOTS is a high level of thinking, where this high level of thinking has two characteristics namely critical thinking and creative thinking. It refers to the cognitive level of Bloom's theory as developed by Anderson and Karthwol, which is that hots-oriented indicators or high-level thinking begin at levels 4.5 and 6, namely analyzing, condensing and creating. Therefore, in developing indicators in the realm of knowledge must start the level.

4.2.3. Integrating technology and information (ICT) in the learning process.

The integration of technology and information (ICT) in elementary schools' learning process is indispensable, considering elementary school students are generation z who are familiar with technology and multi-tasking. Teachers are required, in addition to having pedagogical, social, and mastery skills content or material must also master technology as a supporter in learning. The integration of ICT in learning can also be referred to as TPACK. Did Koehler, M. J, dkk (2013) explained that TPACK is a framework for integrating technology in teaching. The campaign contained in TPACK Rosyid (Wulandari & Iriani, 2018) said there are three campaigns, namely content, academic, and technology.

Designing learning in the era of industrial revolution 4.0 becomes a challenge for teachers in preparing education, wherein the design of learning, ICT integration has been shown in formulating learning objectives, selecting resources, and learning media to determine learning steps. The use of technology in learning in elementary schools can be distinguished into three, namely, the use of technology as a learning medium, a learning resource, and a medium of assessment.

Utilization of technology as a learning medium, teachers can use technology applications that are available for free on the internet such as; cisco Webex, SEVIMA EdLink, Google classroom, Zoom Cloud Meeting, Modle, Schoology, Edmodo, which of course these available applications have their advantages and disadvantages (Miyarso, 2019). Students can dig up information through the internet, such as Google and youtube, as for learning resources. While the media evaluation or assessment of learning outcomes, teachers can take advantage of various exciting applications so that students avoid saturation of learning such as; Quizizz games, Edu-candy games, Google form, Oodlu, google

suite, and so on. The assessment media using various applications is very suitable with the characteristics of elementary school students who, in their development, are still happy to play.

4.2.4. Develop literacy

Literacy here there are two namely reading literacy and numeration literacy. Reading literacy relates to students' ability to understand, use, evaluate, reflect different types of written text to develop the individual capacity of learners. Numerical literacy relates to students' ability to think by using mathematical concepts, procedures, facts, and tools to solve everyday problems in different types of individual student life contexts (Pusat Asesmen dan Pembelajaran, 2020).

4.2.5. Strengthening Character Education (PPK)

The strengthening of PPK in learning is carried out systemically starting from preliminary activities, core activities and closing activities to assessment. PPK developed in the school includes five character values, namely religious, nationalism, integrity, mutual assistance and independence. PPK in learning is not taught directly but integrated in the process of learning activities through active, creative and innovative learning.

4.3. Consider Active Learning Models

Based on the literature study, some research results convey that the learning model that can optimize the competence of the 21st century for elementary school students is an active learning model, among others project-based learning and problem-based learning.

4.3.1. Project based learning

It is a form of active and comprehensive learning that is centered on students with several characteristics, among others; provide students with self-learning opportunities to construct knowledge through research, collaboration, communication and reflective in the real world (Krajcik, Joseph S. and Blumenfeld, 2005). Bender (2012) explaining that project based learning is a learning that can provide meaningful learning to students, where students in learning are not only given limited concepts but learning by doing so that students are able to solve problems actively, creatively, and innovatively. By implementing project based learning students have the opportunity to work and construct tasks given by teachers to produce products (Hosnan, 2014).

Similarly Ika Maryani (2015) said that the application of project-based learning can have an impact on students both the impact of learning itself and the accompanying impact. The impacts of learning include; (1) improve students' understanding of the material; (2) develop critical, creative and innovative thinking; (3) students' creativity will be more productive. The accompanying impacts include; (1) develop the character of the student; (2) establish life skills; (3) improve scientific attitudes; (4) foster the ability to communicate, argue, collaborate / cooperate.

This is strengthened by the results of research conducted by Insyasiska et al., (2015) that project-based learning can increase student motivation with a score of 14%, student creativity of 31.1%, critical thinking of 34% and cognitive 28.9%. This is much improved compared to learning that does not use project based learning. Similarly, the results of the study Saenab et al., (2017) demonstrates that PJBL is able to encourage students to communicate and collaborate between students. This is because project-based learning has complex activities so that students respect each other's differences of opinion to achieve the main objectives of project implementation. Results of research conducted by (Irianti, 2017) also showed that project-based learning is able to increase students' creativity by scoring in cycle I (63.40%), cycle II scored 78.94%.

4.3.2. Problem based learning

It is a learning that uses contextual problems that occur in the environment with several characteristics, namely; explore critical thinking skills, have skills in problem solving, train high-level thinking students and train students to become independent learners (Dwi et al., 2013). Illahi said discovery learning (Dina et al., 2015) is a learning that allows students to engage directly in the teaching and learning process so as to encourage students to discover a concept that is being studied. Results of research conducted by (Rahmayanti, 2017) demonstrates that problem based

learning model learning is able to encourage learners to think critically in problem-oriented situations and problem solving skills and be able to connect knowledge about real-world problems and issues.

Based on the data exposure above, identified 21st century skills that can be optimized include collaborating, communicating, critical thinking and creative. This can be seen in the learning design which emphasizes on collaborating, critical thinking and creative. Similarly, in the application of active learning strategies such as project-based learning and problem-based learning are also able to encourage students to think critically and creatively.

The above learning design can be packaged into interactive media using SAC (Smart App Creator) application. SAC is one of the applications that can be used to design more exciting and interactive learning as Budyastomo (2020) said that Smart App Creator media has several advantages, among others; 1) practical and can be used by students playing while learning; 2) can be used in various platforms, whether Android, iOS, web, Microsoft; 3) there are multiple animations to develop the imagination of students; interactive; 4) supports various types of formats, whether mp3, mp4, png, jpg, gif, pdf, insert webpage, map, or real-time rest; 6) integrated web services, thus making the application more functional.

Based on the analysis above, briefly the designing innovation learning in the era of industrial revolution 4.0 in elementary schools can be seen in the figure 3.

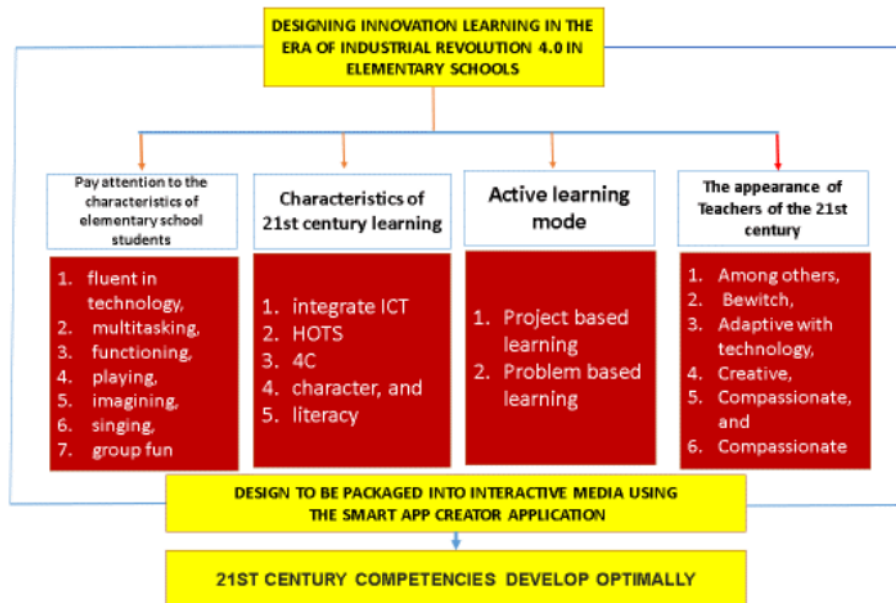


Figure 3. Designing Innovation Learning in The Era of Industrial Revolution 4.0 in Elementary Schools

5. Conclusion

Based on the results of the literature study on the focus of this research can be concluded that the design of innovative learning era industrial revolution 4.0 in optimizing the competence of the 21st century for elementary school students is very important considering four things, namely the characteristics of elementary school students as the generation of the 21st century; Profile of 21st century teachers; the aspects of 21st century learning itself; and consider active learning models that can develop students' creativity. Characteristics of elementary school students include; fluent in technology, multitasking, functioning, playing, imagining, singing, and group fun. The appearance of teachers of the 21st century, among others, bewitch, adaptive with technology, creative, compassionate, and compassionate. Characteristics of 21st century learning include; integrate ICT, HOTS, 4C, character, and literacy in the learning process. The active learning model is project-based learning and problem-based learning. Furthermore, researchers

offered the learning design to be packaged into interactive media using the sac application (Smart App Creator). SAC is one of the applications that can be used to design more interesting and interactive learning. so it is suitable for elementary school students.

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