

Developing Students' 21st-Century Skills Through A Multidisciplinary Approach

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Abstract

The 21st century is characterized by the rapid development of science, technology, and information. Along with the changes and advances that occur, 21st-century skills have emerged which are new needs to face the increasingly complex challenges of life. Life will not be able to be compartmentalized in one discipline alone, but rather run with a whole experience that uses various disciplines that combine with each other in solving a problem. Seeing these conditions, education has the biggest contribution in preparing a generation that has 21st-century skills that are ready to compete globally. One of the ways is to use a multidisciplinary approach by integrating interdisciplinary learning which is usually still compartmentalized so that they form a connection with the aim of providing a deep understanding along with the development of 21st-century skills of students. This research is a literature study that will describe how learning activities using a multidisciplinary approach can have an influence on developing students' 21st-century skills.

Keywords: Multidisciplinary, disciplines, 21st-century skills

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Introduction

The need for human resources (HR) is now undergoing substantial changes. Numerous tasks that were formerly completed by people have been taken over by machines, robots, and high-tech devices. Along with fact that since the start of the industrial revolution 4.0, changes have been

made in how people work and live. In the end, there will always be need for human resources who have the ability to think, communicate and collaborate continue to increase (Spector Levy, 2008; Griffin, 2012; Antoneko, 2014). This is consistent with Mr. Jusuf Kalla's assertion in a seminar conducted at UNY (2019) that the loss of several jobs as a result of the industrial revolution 4.0 has become a momentum for the emergence of several new jobs that require human resources with qualified 21st-century skills.

The emphasis on developing 21st-century skills in Indonesia's educational system is on the 4C competencies, particularly in the context of the 2013 curriculum (Critical Thinking Skills, Creative Thinking Skills, Communication Skills, and Collaborative Skills). Students can prepare for future challenges by developing their thinking skills. Reasoning and information analysis skills are a manifestation of this aptitude. Along with critical thinking abilities, creative thinking abilities are also necessary. Humans have made numerous inventions in a variety of sectors, which is evidence that this talent contributes to the emergence of a globally evolved civilization. In addition to thinking skills, communication skills are also important along with the development of sophisticated times where communication between humans is no longer limited by space and time. Even in 2020 when the Covid-19 pandemic entered Indonesia, all educational institutions struggled to adapt by conducting distance learning online. Nowadays, people from different parts of the world can easily connect to exchange information. As a result, there are numerous opportunities to deepen connections and increase knowledge. Collaboration is the final ability that is equally crucial. Time is valuable in today's fast-paced and highly productive world, thus most work is done in collaborative teams. This skill is even one of the key indicators taken into account when hiring new employees.

Thus, education has a very important role in creating a teaching and learning climate that can facilitate the development of students' 21st-century skills to the fullest (Utami, 2019). One option that can be offered is using a multidisciplinary approach which will be discussed comprehensively in this article.

Methodology

The method used is a literature study. The literature study in this study is a series of activities in the form of collecting library data, reading and recording, and analyzing the effect of a multidisciplinary approach on the development of 21st-century skills of students. The data collected and analyzed are secondary data in the form of research results such as books, journals, articles, internet sites, and others relevant to the variables of this study.

Results

Multidisciplinary Approach

The multidisciplinary approach is part of an integrated curriculum. Beane, (1997) defines an integrated curriculum as an approach that aims to integrate learning across disciplines/subjects that are usually still segmented in order to provide a bridge across other disciplines and help students in increasing their knowledge and understanding. In a multidisciplinary approach, each discipline is still privileged, but links between several disciplines are deliberately made. At secondary school level, students study the same theme in different classes according to subject. This means that learning activities are carried out by discussing topics or problems in various disciplinary contexts.

An illustration of a chart showing the design of a multidisciplinary integration model is shown below:

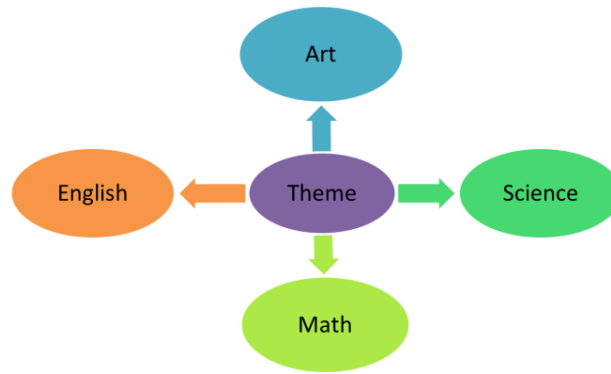


Figure 1. Multidisciplinary chart

An approach is used from a multidisciplinary perspective to develop a culminating activity where students will work across several subjects (Drake, 2012). Therefore, subject teachers continue to teach each of their parts while referencing the established theme or topic. The learning process in each subject will support the culminating activity that will show the integrity of the integration of several subjects. According to Drake & Burns (2004), secondary education teachers will more frequently choose to integrate the curriculum using the multidisciplinary model since it offers them the freedom to teach their topics. The meaning of freedom here is that daily learning activities can be modified independently by each teacher, but still refer to the theme or topic of integration that has been determined.

Designing a Learning Unit

There are seven steps in designing integrated learning, (1) Scan standards vertically and horizontally to select the broad-based standard for each discipline, (2) Choose an age-appropriate and relevant topic or theme, (3) Create a web to identify potential clusters of standards, (4) Construct the KNOW/DO/BE bridge, (5) Design a culminating assessment (6) Recreating a web to identify potential clusters of standards (7) Generate instructional activities and assessments. Although each integration strategy (multidisciplinary, interdisciplinary, and trans-disciplinary) will have its own characteristics in determining the connections between subjects that are integrated, the learning integration planning framework from Drake (2012) above is a basic pattern in developing learning units. In this discussion, for instance, a multidisciplinary approach is used in seven steps to connect or link subjects. These steps include first identifying the standards or fundamental competencies of each subject and cross-disciplinary standards, then determining general concepts to get standards that can be integrated into a theme. The next step is to identify the representative assessment for each standard that has been determined, then associated it into an integrated activity, unit, or project, where a culminating activity will be completed at the end of the learning unit. Lastly, contextualize learning and design assessment tools. The steps of making connections across subjects can be illustrated through the following template prepared by Kathleen Harris (Drake & Burns, 2004:102):

The point of implementing a multidisciplinary approach that combines several fields of science or subjects is how these fields of science/subjects are interrelated or connected in a series of learning activities through a predetermined theme. Therefore, deciding the procedures to follow while creating lesson plans is not an issue for teachers.

Learning Implementation with a Multidisciplinary Approach

The implementation of the curriculum is realized in the teaching and learning process by the principles and requirements of the curriculum that has been developed for a particular level of education or school/madrasah. In the implementation of the integrated curriculum, teachers are required to have the ability to implement various teaching and learning strategies that are by the characteristics of the curriculum that have been described previously. Drake & Reid (2018) offer several learning strategies that include the constructivist approach, inquiry, experiential learning, personal relevance, student choice, and differentiated instruction.

A learning method that utilizes a multidisciplinary approach enables students to actively investigate and discover scientific concepts and principles in a comprehensive, meaningful, and authentic way, both individually and in groups. This learning approach places a strong emphasis on applying the idea of learning by doing. Students will comprehend the principles they discover through first-hand experience and relate them to other concepts they already know (Rusman, 2009). One of the keys to successful learning with a multidisciplinary approach is to provide a learning environment that places students to gain learning experiences that can connect concepts from various fields of study.

Evaluation of Learning with a Multidisciplinary Approach

Evaluation is the last stage in implementing an integrated curriculum with a multidisciplinary approach. At this stage, activities and measures of the results achieved are required. This talks about assessing the achievement of learner competencies based on indicators designed by teachers. The assessment system used is no different from the conventional assessment that is usually used. Assessment is carried out by tests and non-tests in written and oral form, performance observation, attitude measurement, assessment of work, projects, or products, use of portfolios, and self-assessment (Trianto, 2007). Non-test assessment can be done by analyzing problems and presenting solutions or using problem-solving activities. In general, the assessment system should also be integrated, but in certain conditions, the separation of assessment can occur, depending on the teacher's choice. The summative evaluation is completed during the culminating activity at the end of the learning unit, which will demonstrate how the subjects are integrated.

The Concept of 21st-Century Skills

The 21st Century Skills are defined as a set of knowledge, skills, work culture, and character qualities that are widely acknowledged as being necessary for success in today's world, especially in various college programs and career or work environments, and can be applied in all academic areas in all types of education, career and society through the lives of learners (Tindowen, Bassig & Caguragan, 2017; Moyer, 2016). The partnership for 21st Century Skills (P21) developed a framework for 21st-century education. This framework describes the skills, knowledge, and expertise that learners need to be successful in entering today's world of work. The 21st-century skills include (1) life and career skills, (2) learning and innovation skills, and (3) information media and technology skills. Trilling & Fadel (2009) explain that learning and innovation skills include three competencies, namely: (1) critical thinking and problem-solving; (2) communication and collaboration; and (3) creativity and innovation. So it can be concluded that there are four important skills included in learning and innovation skills. These skills are critical thinking, creativity, communication, and collaboration.

The Partnership for 21st-century skills (2011) outlines 21st-century skills (4Cs) into several indicators. Furthermore, the Buck Institute for Education (Boss, 2015) made a derivative of the P21 framework to produce simpler indicators, both in building learning and measuring 21st-

century skills themselves. Based on the indicators from the two derivatives, the author determines several indicators of 21st-century skills (4C) that will be used in the description of relevance with a multidisciplinary approach. The indicators are described in the table below:

Table 1. The Indicators of the 21st Century (4C)

Skills	Indicators
Critical Thinking	a. Effectively analyze and evaluate facts, arguments, claims, and beliefs. b. M Analyze and evaluate multiple perspectives. c. Synthesize and make connections between information and opinions. d. Interpret information and draw conclusions based on the best analysis.
Creative Thinking	a. Use effective and efficient ways to obtain quality data. b. Select appropriate strategies and develop original ideas for the chosen solution. c. Use effective, efficient, and interesting ways to express findings.
Communication	a. Communicate effectively either in person or through media for various purposes, b. Be able to organize thoughts, data, and findings, and share them effectively through a variety of media c. Communicate well both verbally and in writing. d. Listen effectively to obtain meaning that includes knowledge, values, attitudes, and goals. e. Communicate effectively in a variety of different environments (including multilingual and multicultural).
Collaboration	a. Demonstrate skills to work effectively and systematically in a diverse team. b. Exercise flexibility and awareness to engage in achieving goals. c. Valuing the contribution of each member of the group. d. Work according to responsibilities in completing tasks.

Discussion

In Indonesia, the integration of several subjects is commonly used at the elementary and junior high school levels of education, but for senior high school and higher education, this approach is rarely implemented considering the curriculum structure is in the form of a separate subject curriculum. Of the several types of approaches used in the integrated curriculum, the multidisciplinary approach is the most suitable approach to be applied at both levels of education. To be adaptable to the education system in an increasingly advanced era, high school and higher education should not adhere to a system of separation of subjects or disciplines that is too rigid (Liu et al., 2019).

The most effective way to teach 21st-century skills is by using a multidisciplinary approach (Drake & Reid, 2018). The multidisciplinary approach has learning and assessment tools that train students to be able to solve complex problems related to the challenges of an increasingly advanced

life. Students are directed to develop their abilities without being limited by compartmentalized fields of the subject. In line with this, the positive effect of learning activities with a multidisciplinary approach is that when educators change the focus of learning to be more relevant to real life, students will be motivated to learn, and even become active learners (Alghamdi, 2017). When students' motivation has been well established, it will be easier to explore and optimize every ability that students have.

Learning activities with a multidisciplinary approach will stimulate students to actively explore and discover subject concepts and principles holistically, meaningfully, and authentically (Mard et al., 2022). Students will get meaningful learning because it emphasizes real problems in everyday life that can be solved using several disciplines that combine with each other. Through this experience, learners' 21st-century skills will be further enhanced coupled with the new perspective that students have, when being able to see the interconnection between subjects that have been studied (Akçay et al., 2022; Jehlicka et al. 2018).

The highlight of learning that uses a multidisciplinary approach is the culminating activity which will further sharpen the 21st-century skills of students because critical and creative thinking skills become a tool to be able to analyze various things, especially in finding solutions to problems effectively and efficiently. In addition, communication and literacy skills as well as collaboration become support when students present the project that has been completed during the culminating activity. Thus, the overall series of learning activities using a multidisciplinary approach can develop 21st-century skills, especially the 4C skills of students.

Conclusion

The selection of approaches in teaching and learning activities is certainly expected to have an optimal impact on students. In choosing the learning approach, an educator's sensitivity to the times is needed so that the output of the education system is a generation that is ready to live and compete in the future. In this regard, the 21st century is now referred to as the century of knowledge, globalization, information technology, knowledge-based economy, the industrial revolution 4.0, etc. In addition, there will continue to be very rapid and unpredictable changes in all aspects of life. Therefore, it is not surprising that every educator is required to develop and design a lesson that emphasizes the development of 21st-century skills.

Learning using a multidisciplinary approach emerges as a response to the challenges of the times when humans must face an increasingly complex and connected world, both physically, logically, and emotionally.

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