Learning environment technology-based in improving students’ independent learning

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Abstract. Immense technology development in the Industrial Revolution 4.0 has to get rapid. Transformative technology requires educators to equip themselves with digital capacity in applying technology utilization in learning. Currently, learning environment technology-based has become a major trend upon education. Technology provides opportunities for everyone to improve endlessly in enhancing students’ learning independence. Technology plays a significant aspect in providing various learning sources that encourage students to be more active, creative, innovative, and independent. Research sample being studied was 34 students of SMA in Jember district. Data collection technique used was the questionnaire. Data processing was engaged SPPSS for windows. The research results of students’ independent learning during pretest obtained average score of 51.29 and students’ learning rate during a post-test obtained average of 60.18, it means students’ autonomous learning between pretest and post-test experienced inclination at 8.89. This study recommendation is that learning environment technology-based needs to be intensified, since it brings new possibilities upon education field. Technology utilization towards education has a significant part in providing ability as part of life skills, students undoubtedly need that. There are numerous learning sources alternatives being offered with technology which optimizes students potential to become independent learning and success as life long learner.

1. Introduction

The Industrial Revolution 4.0 resulted in a fusion between digital and physical sense through technological advances namely ICT and IoS (Internet of Services) [1]. The industrial revolution 4.0 does not only affect business, governance, and society, but also in term of education, encouraging the emergence of the term 4.0 education [2]; [3]. The industrial revolution 4.0 frames people's lives within the center of technological progress. The revolution enhanced an extremely decent society called society 5.0 [4]. Society 5.0 examines to place humans towards the center of innovation and actively utilize technology in various aspects of life [5].

The rapid development of technology within the era of industrial revolution 4.0 brought several conveniences, including for educators [6]. Transformative technology requires educators to equip themselves with technological skills in an effort to meet the students learning needs upon digital era [7]; [8]; [9]; [10]. Digital era proposed students who are were born between 1995-2012, known as generation z or "digital natives" [11]. Generation z is quite unique and distinctive, which have tendendy to think practically and independently by utilizing technology [12]; [13]. Mastery of technology makes z generation process information very quickly, so it has the opportunity to be more innovative [14]. Generation Z was born in an era of advancement and easy access to technology in everyday life.

Covenient access upon information through the internet has substituting books and as part of of information sources [15]. The role of information technology with establishing decent learning resources encourages students to be more active, creative, innovative, and independent [16]. Technology utilization allows one educators to formulate a learning process that accompanies more innovative and enhances students to study optimally [17]; [18]. Technology encourages students to be independent learners and be responsible towards their own learning [19]; [20]. The interactive
relationship between technology utilization and learning process establishes and empowers students to boost individual responsibility as well as educators are not always the main source of providing information, hence students become more active, motivated, and able to examine knowledge independently.

Independence is one of the main values in the sense of character education of the Indonesian nation, in accordance upon 2013 Curriculum objectives to propose students as independent human beings and life-span learners [21]. The goals of character education will be easily achieved if educators have the flexibility of mindset, innovation, and ingenuity to accommodate between lesson content, educational goals, and character values [22]. History learning obtains a role upon character building, through understanding and reaffirming the prominent values of a nation struggle, that is expected the heroism spirit will be continued towards next generation. Indonesian history has illustrated a picture which shows persistence, independence, mutual respect, and the spirit of unity as the main features of shaping the nation. Students are expected to be able to acquire the values of the past events to be implemented in present and future times [23]. In this sense, history subjects obtains a role in establishing students independence character.

The level of independence students is varied. Independence rate could be increased through learning activities that involves students to think creatively, hence students will be able to analyze and formulates hypotheses and be able to solve problems independently [24]; [25]. Independence requires self-awareness, habits and gradual practice of discipline. Independence could be encouraged by implementing a learning environment that suits students to take an active role within learning process, such as diagnosing their learning needs, formulating learning objectives, identifying learning resources or materials, implementing appropriate learning strategies, and evaluating learning outcomes [26]. Thus, the application of a learning environment that supports students to play an active role in the learning process can increase the independence of students.

Educator have to ensure that learners could achieve learning goals and develop technology skills to facilitate lifelong learning. Students need to be accustomed to have a lifelong enthusiasm for learning, because most aspects of life tend to experience major changes dynamically [27]. Significant factors to encourage the students’ independent learning are their interests and passion to learn [28]. Students will be motivated to learn if the content gained is meaningful for themselves. Educators have a duty to facilitate students by designing a supportive learning environment to achieve learning goals [29]. Technology-based learning environments engagement provides a stimulus for reflective investigation and continuous intellectual development [30]. The role of technology with creating proper learning resources encourages active students.

Based on the background mentioned above, the urgency of technology in life and the needs of learning, this research focuses on technology-based learning environments utilization. Several rationales underlying this study are namely: (1) The rapid development of technology reaches people’s lives in various fields, especially education. Students should be encouraged and empowered to engage technology as a mean of communication and collaboration in learning in an appropriate way to become knowledgeable, competent and up-to-date members of society [31]; (2) Technology-based learning environment is the latest manner of education within an active learning approach that focuses on the involvement of students in the learning process [32]; (3) technology-based learning environment encourages more effective learning by increasing the motivation and independence of students [33]; The application of a technology-based learning environment seems to be effective in encouraging students to be actively involved in the learning process, hence students become more creative, innovative, and independent in learning. Therefor, the focus of this study is to determine the role of a technology-based learning environment upon students independence. Specifically, the study aims to determine the differences in the level of independence of students prior and after engaging technology-based learning environments.
2. Methods

This study engages quantitative approach. This type of research is experimental research, which aims to determine whether there is a causal relationship between two or more variables. In this sense, researchers applied a technology-based learning environment towards independent variables, controlled other relevant variables, and observed their effects upon the dependent variable, namely the students independence. The research sample used in this study was 34 students of high school in Jember Regency.

This study employs the Steinberg independence variable which includes three aspects, namely: (1) Emotional Autonomy, which is an aspect of independence that states changes in the closeness of an individual's emotional relationship with parents or with other people; (2) Behavioral Autonomy, is an aspect of independence that has the ability to make decisions without depending or involving other people, so that it is able to be responsible for decisions that have been made; and (3) Cognitive Autonomy, which is an aspect of independence that has the ability to interpret the principles of right and wrong, as well as the principles of importance or insignificance [34]. The research instrument used in this study was a questionnaire. The following is a self-reliance instrument grid developed from Steinberg.

| Table 1. Independence Questionnaire |
|-----------------------------------|
| Aspects                           | Indicators                        | Question number |
| Emotional Autonomy                | De-Idealized                      | 1               |
|                                  | Parent as a people                | 2               |
|                                  | Non- dependency                   | 3 & 4           |
|                                  | Individuation                     | 5 & 6           |
| Behavioral Autonomy              | Make Decisions as Well            | 7,8, & 9        |
|                                  | Changes in Susceptibility to Influence | 10 & 11        |
|                                  | Expectations for Autonomy         | 12              |
| Cognitive Autonomy               | Religious Beliefs                 | 13,14, & 15     |
|                                  | Principal belief                  | 16              |
|                                  | Independent belief                | 17 & 18         |

The questionnaire was given before and after learning activities in the form of pretest and posttest with the same number of questions and scores. The assessment of each question on the independence questionnaire utilized Likert scale which requires respondents to complete statements with the following answer choices: 1) Strongly disagree; 2) Disagree; 3) Agree; 4) Strongly Agree [35]. The scale value of each answer could be seen in the following table:

| Table 2. value of the questionnaire scale |
|------------------------------------------|
| Statements                               | Value |
| Strongly disagree                        | 1     |
| Disagree                                 | 2     |
| Agree                                    | 3     |
| Strongly Agree                           | 4     |

(Sumber: Gay et al., 2012:567)

Independence is categorized into very suitable independence, moderate independence and low independence using the mean and standard deviation of the level categorization [36]. We can see the criteria for independence in the following table:
Table 3. Independence criteria

| Variable        | Formula                        | Value Range      | Category |
|-----------------|--------------------------------|------------------|----------|
| Independence    | X > (Mean + 1 SD)              | X > 54           | Tinggi   |
|                 | (Mean – 1 SD) < X ≤ (Mean + 1 SD) | 36 < X ≤ 54      | Sedang   |
|                 | X < (Mean – 1 SD)              | X < 36           | Rendah   |

(Source: Ary et al., 2010:114)

Data analysis in this study engaged a paired sample t-test using SPSS for windows. The paired sample t-test was used to compare the difference between the average of pretest and posttest of students' independence. Paired sample t-test could be used with the prerequisite that the data engaged must be normal. Normality test engaged Shapiro-Wilk using of SPSS. The decision making criteria in this study employed a significance level of 5%.

3. Results and Discussion

Initially, the data is tested for normality first. The results of the Shapiro-Wilk normality test showed that the pretest data were normally distributed (p = 0.154). Hence, data is considered normal.

Pretest and posttest data of students learning independence could be seen below;

Table 4. Descriptive Result of Statistic Pretest and Post Test

|                                | Mean | N  | Std. Deviation |
|--------------------------------|------|----|----------------|
| Pretest Independence           | 51.29| 34 | 4.609          |
| Posttest Independence          | 60.18| 34 | 3.950          |

Based on table 4, it reveals that the pretest average value of learning independence is 51.29, indicates moderate independence category and the posttest average score of 60.18 indicates the high independence category. The average posttest score shows that the independence of students has increased after implementing a technology-based learning environment. The increase in the independence of students can be seen in Figure 1.

Table 5. Result of Paired Samples Test

| Paired Differences            | Mean | Std. Deviation | Std. Error | t      | df  | Sig. (2-tailed) |
|-------------------------------|------|----------------|------------|--------|-----|-----------------|
| Pair 1 Pretest Independence - | -8.89| 4.531          | 0.777      | -11.430| 33  | 0.000           |
| Posttest Independence         |      |                |            |        |     |                 |

Based on table 6, it shows that the results of the paired samples test show that there is a very significant difference (p, 0.05) between the independence of students before and after the technology-based learning environment is applied. The results of the paired samples test in the mean column obtained an average difference of -8.89 (posttest - pretest), negative numbers indicate that the mean value of independence of students in the posttest is greater than the average value of the pretest. This means that the magnitude of the difference in the average pretest and posttest independence of students shows that the posttest value after applying a technology-based learning environment is greater than
the pretest value. The increase in the independence of students at the pretest and posttest can be seen in the following figure.

**Figure 1. Student Independence Results**

![Student Independence Graph](image)

Based on the diagram above, it is could be seen that the pretest average value of students' independence is 51.29 indicating the category of moderate independence before the technology-based learning environment is applied and the posttest average score of students' independence is 60.18 indicating the category of high independence. The average posttest score shows that the independence of students has increased after utilizing a technology-based learning environment. The results of this study, as stated in the previous section, illustrate that the technology-based learning environment encourages students to be independent in learning and be responsible for their own learning by utilizing the use of information technology as a means of supporting learning activities. The results of this study strengthens the research findings conducted by Song & Hill in 2007 which states that a technology-based learning environment presents an interactive relationship between learning process and students independence towards self-regulated learning namely planning, monitoring, and evaluating. The learning process depends on of strategies, resources, ability to motivate themselves and be involved in the learning process [37]. The interactive relationship in learning rises and enhances students that learning is an individual responsibility. Students become more active, motivated, and can explore knowledge independently.

Technology plays an important role in 21st century learning. Technology serves as a useful means of realizing innovative constructivist learning in accordance with the needs of students in formulating literacy within environment which possess knowledge and technology [38]. Nowadays, students have learned to obtain relevant and necessary information to solve problems or meet the curiosity [39]. Technology-based learning environment brings outstanding notion for students towards self-regulated learning namely planning, monitoring, and evaluating. The learning process depends on of strategies, resources, ability to motivate themselves and be involved in the learning process [37]. The interactive relationship in learning rises and enhances students that learning is an individual responsibility. Students become more active, motivated, and can explore knowledge independently.
medium in planning the learning process and to increase the independence and self-management of students [43]. The flexibility of students in accessing information through the application of a technology-based learning environment could support the learning process, increases knowledge and understanding of the subject matter being studied as well was increases learning independence.

4. Conclusions

The findings of this study represent the application of a technology-based learning environment to students independence learning. This study aims to determine the differences in the level of independence of students before and after being implemented using a technology-based learning environment. The results showed that the pretest average score for independence of students was 51.29 indicates moderate independence category and the posttest was 60.18 indicates high independence category with a difference in the average value of -8.89 (pretest-posttest), negative numbers indicate that there is an increase in the average value. independence of learners after applying a technology-based learning environment.

The level of independence of each student is varied. An independent attitude cannot grow easily. Independence requires self-awareness, habits and gradual practice of discipline. The independence of students can be improved by implementing a learning environment that supports students to take an active role in the learning process. Recommendations for practice and further research include the development of a technology-based learning environment to be applied in the learning process of students with a much broader scope.

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