Proceeding International Conference Of Innovation Science, Technology, Education, Children And Health
Vol. 3 No. 1 2023
e-ISSN : 2776-9062, Hal 108-121
Available online at: https://icistech.org/index.php/icistech/

Polytechnic Education in the Distruption of Technology and Industrial Revolution 4:0

Toyipur

PTP Polimedia, Jl Srengseng Swah Jagakarsa – Jakarta, Indonesia
Corresponding Author: *Tpimron64@gmail.com*

Abstract: *The learning system in the majority of Polytechnics uses Blended Learning systems including face to face, practice / workshop and online with learning composition; 40% theory and 60% practice with industry link and match mechanisms. For industry link and match, a comprehensive policy between ministries is needed to determine the functional position of the Learning Technology Developer (PTP) as an integrated manager of the learning program in tertiary institutions especially the Polytechnic both various learning resources, methods, teaching materials, media and learning environments so that learning outcomes can increase the production of goods and services quickly, effectively and efficiently through meaningful, enjoyable learning. The method used in this research is "descriptive quantitative" because it describes, describes, and interprets the conditions, events, processes that are happening in the context of the problem. This research is intended to explore and clarify a phenomenon or social reality clearly. Online and conventional system learning methods or blended learning enable HR outcomes that are able to overcome technological disruption, on the other hand the hopes of the President and Menristekdikti that the ability to deal with the industrial revolution 4.0 in the era of technological disruption and globalization competition is not only through special abilities obtained because of completing master's education, master's degree in tertiary education which is said to produce responsive ability of industry 4.0 involvement but through improvement of learning culture. Indicator 0.033% of HR career as Developers of Learning Technology in tertiary institutions shows low regard for tertiary institutions in developing learning programs in the development of learning programs both the management of various learning resources, methods, media, teaching materials and learning environments according to the need for meaningful and enjoyable learning, this is caused by professional ego, sectoral ego.*

Keywords*: Educational of Polytechnic, Technology Disruption, Industry 4: 0*

1. INTRODUCTION

The learning system at the Polytechnic mostly uses a Blended Learning system (mixture) of face-to-face, practical/workshops. And on line with composition learning ; 40% theory And 60% practice on emphasis relatedness and compatibility (Link and match). In the era of globalization which is full of competitive competition, Polytechnics demand professionalism in human resources in all aspects of the organization or institution, both in the existence of lecturers, functional Learning Technology Developers (PTP) and professional education personnel.

Entering cooperation economy Countries Asia Southeast through Area Trading Free ASEAN (ASEAN Free Trade Area/AFTA) in 2020 Polytechnic Education needs to implement a policy of developing students as a source of Power Man Which competent in face challenge revolution industry 4:0. Required Also learning integration Which capable apply production goods whatever service in a way fast, effective And efficiency through instructional Media with system online And conventional so that HR Which to the fore learning with Link and match missions for industry, entrepreneurship or micro-

Received June 01, 2023; Revised June 14, 2023; Accepted June 28, 2023; Published June 30, 2023

economic business actors can expand access market, impact challenge decrease field Work consequence disruption technology advanced can overcome. In education media functioning as means physique delivery material or carrier message. Various type media that can used in activity learning like : board write, overhead projector, flip charts, video, film strips, LCD projector, object three dimensions, book text or module, program computer, And and so on (Yafie, 2020).

Development media social influence use blog so that most public Indonesia Now this tends to use facebook moment socializing media. Programmed learning or learning programmed is a systematic method for teaching skills that includes presenting questions or facts, for example by using workshop/offline or online learning, which can be an alternative in designing model- model or methods strategy learning Which is Wrong One element from element main in designing learning.

Learning through blog media, where blogs are a form of web application that resembles writings (loaded in form post) And usually can accessed by all user Internet, in accordance with Topic And the purpose of blog readers and users Trading free ASEAN will cause competition strict Good goods So or commodity and also service in a way fast and effective. This means that Polytechnic education must be able to increase quality competitiveness, prepare quality human resources with expertise and skills according to the needs of industry or the business world, especially for lecturers/teachers, PTP functional and students. when do not want to be a victim of the Asean Free Trade Area/AFTA.

Threat Technology Disruption

According to the definition of the World Economic Forum, the industrial revolution 4.0 is the disruption of internet technology into the production process so that the processing of goods and services can be more efficient, faster, and more mass.

This is characterized by the use of robotic technology, intellectual engineering, the Internet of Things (IoT), nano-technology, and a system called cloud computing.

In the first industrial revolution (1), mass production of goods was recorded as using steam and water engines as part of product mechanization, whereas in the second industrial revolution (2), production mechanization emphasized the use of electronic devices.

Entering the 20th century, the industrial revolution entered its third (3) stage in the form of the use of technology and automation in the mechanization of production, the difference with industry 4:0 is the use of the internet and the speed of production.

In the report entitled The Future of Jobs released by the World Economic Forum (WEF) in 2016, it was emphasized that industry is starting to switch to using intellectual engineering, machine learning, automated transportation, and very intelligent robotics which will start to dominate the production process until 2020.

A survey of several industries conducted by the WEF even showed the use of cloud technology and mobile internet. become focus model business they in time front, furthermore followed by development technology processing data and the use of big data into the production process, where industry players will start to adapt by 2025.

The issue of the industrial revolution 4.0 is not just a change in production patterns, there are latent dangers lurking and making this a topic that must be addressed seriously by Polytechnics, Colleges, Institutes, Universities, academics, academy community And Government, Where threat That appear in form the disappearance a number of future jobs.

WEF predict will There is 4.75 million worker administration in 18 country threatened laid off Because disruption technology until 2020. Not to be missed, 1.6 million workers in the manufacturing sector are also likely to lose their jobs, the demand for workers who require experts and high skills will increase for example expert mathematics, expert computer, expert marketing, expert plant, expert drug, expert menu, expert bioenergy, expert waste, expert media learning And etc. This because work Which Have level skills low has been replaced by automation

Indonesia viewed prone to exposed the disappearance a number of field work alias happen disaster unemployment on a large scale, this is because the Indonesian workforce profile is dominated by low-educated workers who do not have special skills.

Data Body Center Statistics (BPS) on August 2017 Then take notes amount resident Work as much as 88.43 million, or (40.69%) of them are only elementary school (SD) graduates, as many as 22.4 million people or (18.09%) of the working population are junior high school graduates.

Education formal Indonesia in the form of system tiered each other related consists of from SD, IN, JUNIOR HIGH SCHOOL, MTS, SENIOR HIGH SCHOOL, MA, Vocational High School, Vocational High School, and the highest is higher education.

Fundamental changes in the assessments applied have made it easier to move up a class and graduate, making it increasingly possible for school-age children to continue their education. Increasing access to all levels of education has a correlation that has an impact on the quality of college graduates, especially Polytechnics, because they will be able to contribute to inventions and innovations from the learning process with a blended learning

system that emphasizes the relevance and suitability (Link and match) to the industry.

The above shows the relationship between levels of education that underlies the analysis presented. This paper aims to discuss Polytechnic education, because of the relationship between levels, its condition cannot be separated from developments. And trend Which happen on level education more low that is Vocational School, MK And SENIOR HIGH SCHOOL or MA, Population census 1971 (Table 1).

Challenge Disruption

New students 60% of elementary school age children attend school; 44% of junior high school age population (13-15), 21% of high school age population (16-18), and only 8% of higher education age population (19-24), follow education in diploma and/or undergraduate programs. Almost ½ century later, the latest Susenas data in 2017 shows that almost all elementary school age children, 99%, attend school; for junior high school age children it has reached 95%; high school age children 71%, but the figure for college age is still growing rather slowly, only reaching 25%

Until moment This student S1 Still very dominate composition Residents campus education tall.

Undergraduate students constitute 81% of the total registered students, but have decreased slightly due to the popularization of skills education, including Diploma I, II, III, IV, Professional, Applied Masters Polytechnic education. Which his role increase from 13% between total student but has become 15% from student new, only just enthusiasts for enter to Polytechnic student new relatively decrease Possible due to program, material teach, media, method and the environment study it Which Not yet capable give contribution big to interest, talent consequence disruption In addition, the Polytechnic's human resources, which are said to be the best human resources, namely lecturers, through research and learning, have not been able to answer the challenges expected and fulfill the hopes of the President and the Minister of Research, Technology and Higher Education so that nation Indonesia can become player in Revolution Industry 4.0 For produce invention And innovation Because shackled on ego profession or ego sectoral.

In bureaucracy government there is relative more Lots incentive for civil servant For increase his education to anticipate the impact of technological disruption.

The level of education determines the functional role of the Learning Technology Developer (LTP) for educational programs, media and learning methods, the possibility of access to structural positions with various opportunities and activities so as to be able to

provide better role in managing programs, teaching materials, media, environment Study And method learning Which can expected produce change Which can become invention and innovation in higher education circles.

Program education Polytechnic should in its implementation need notice aspect science And technology, and pay attention aspect public And environment, For That material his learning can taught with science, environment, technology and society (SETS) approach or is a form of learning activity that reciprocally links elements of science, environment, technology and society (Binadja, 2005).

Based on background behind the on so researcher want to know problems as following ;

a. Is the implementation of the learning program in accordance with the interests and talents that are enjoyable and IT-based and have met the needs of students?
b. Whether means infrastructure learning based on IT, environment study, method material teach And learning media according to needs?
c. Are IT-based learning facilities, teaching materials, media and learning environments managed by the Learning Technology Developer function?

Program learning Polytechnic done with system blended learning Which Possible can developed with the ADDIE development model, this is based on the idea that this model is as follows:

a. Give chance For do revision (evaluation) in a way Keep going continuously in every stage Which through so that it can produce better media, teaching materials and learning environments,
b. Model This very simple However its implementation systematic, ,,
c. Model This stand on on runway theoretical design learning Which consists of on 5 (five) step, that is: (a) analyze (b) design (design), (c) development (development), (d) implementation (implementation), and (d) evaluation (evaluation) : (Branch, 2009).

Miscellaneous source media mass For policy public must notice:

1. Growth media on line For various age must fixed with various steps useful adjustments to anticipate and handle cybercrime problems, privacy data, for example personal data protection, online loan crimes; gambling and online immorality Development media on line must in line with objective development George W. Samuel1 , Elvis R. Shauki2 "Analysis And Evaluation Disruption Technology" say that

Development technology Information causes technological disruptions in the supply chain which results in uncertainty in market conditions and triggers additional costs

so that business actors experience difficulties in determine determination price, happen decline amount volume sale, cause many the company suffered losses and not capable maintain sustainability his efforts Which result in the explosion unemployment, Journal Asset (Accountancy Research), 12 (1), 2020, 73- 93

Dr. Anak Agung Gde Bagus Udayana, S.Sn., M.Si "Digital Technology Disruption" said that the disruption phenomenon that has emerged recently has caused fundamental changes in everyday life. Disruption is a leap change from the system long to new ways. Disruption also changes old technology that uses more physical to digital technology and produces something completely new, more useful, and more efficient and faster with media such as: Facebook, WhatsApp, Email, or Instagram with not too much capital, and can be done anywhere, anytime "the phenomenon of technological disruption causes mass unemployment everywhere- where including world education elementary-intermediate, education tall Polytechnic Which apply face-to-face learning 40%, practical learning 60%, National Seminar Envision 2020: Creative Industry

2. METHOD STUDY

In accordance with description Which has put forward on objective study, so objective operational Which want to achieved of this study is to find out whether the IT-based learning infrastructure, teaching materials, media and learning environment of the Polytechnic are in accordance with the needs and managed by certain functions, namely Learning Technology Developers or PTP. The method used in the study is "quantitative descriptive" because nature to describe,

to describe, And interpret conditions, events, processes that are occurring in the context of the problem. This research is intended to explore and clarify a phenomenon or social reality clearly. Describe the variables related to the problem and the unit being studied.

This quantitative descriptive method is not intended to search for theories, not to test the theories that are emphasized. on interview And atmosphere natural (naturalistic settings). Researcher in matter This act as observer, create behavior categories, observe symptoms, and record them in an observation book

The ADDE model is a model that is arranged in a programmed manner with a systematic sequence of activities in an effort to... breakdown problem Study Which related with source Study Which in accordance with need And learner characteristics, model ADDE stand on on runway theoretical design learning Which consists of on 5 (five) step,

that is: (a) analyze (b) design (design), (c) development,(d) implementation , and (d) evaluation

Analysis Data

The data and information needed to make descriptions and analyses are obtained from various sources used as research samples. Instruments Which used in research is documentation, instrument development is carried out through several stages, as follows:

1. Review theory Which related with all variable Which researched,
2. Compile indicators from every variable,
3. Compilation grain question And determination scale measurement,
4. Analysis grain And testing validity instrument study.

Instruments for measuring learning achievement starting from facilities and infrastructure (sapras), Information Technology (IT) facilities, learning programs, methods, teaching materials, media and learning environments that have not been managed by functionalities. Developer Technology Learning (PTP) as profession developer technology learning consists of on the concept instrument final Which direct used For measure variable culture Learning Polytechnic era Industry 4:0 Technology Disruption

The calibration process is carried out by analyzing the instrument's data results to test the validity of the instrument items using the correlation coefficient between the item score and the total instrument score. The statistics used are the product moment correlation coefficient (r).

The criteria used for the item validity test is rtable = 0.05. This means that if rcount is smaller than rtable then the item is considered invalid and is then dropped or not used.

Reliability instrument counted with use formula coefficient Alpha Cronbach

The data collection technique used is documentation, this technique is used to obtain data and information that supports and complements each other about Polytechnic Education in order to avoid the impact of Technological Disruption from the Industrial Revolution 4:0.

3. RESULTS DISCUSSION

Discussion of the description of research data that has been grouped according to the research instrument, based on the results of the calculations that have been carried out, the description of the research data is presented to provide a general overview of the distribution of data.

The data presented is data that has been processed from raw data using descriptive statistical techniques. The data is presented in the form of frequency distribution, total score, average score, standard deviation, mode, median, maximum score and minimum score.

Score empirical variable culture Study varies between score minimum 53 until score maximum 81 with range score of 28. The results of the descriptive statistical calculations obtained an average score of 71.3; standard deviation 7.33; median 71.5; and mode 88

Analysis data whether implementation program learning Already in accordance interest, talent Which pleasant with IT-based has met the needs of students?

Based on table 1, the distribution of learning culture scores showed that around 33% scored below the minimum score. group average (71.3), or around 63% to obtain score in on group average (71.3). Score average 71.3% indicated that the Polytechnic learning culture so far has not shown a correlation or relationship between interests, talents and the Information Technology (IT) based learning program process.

In table 3, we can see the interest and talent, score total obtained from 6 statement items with a score maximum is 585, so that percentage Which obtained is 82.57% with average 4.17 with mark The highest is 5, meaning that the objectives of the Polytechnic learning program in the graduate competencies adopted and applied in Polytechnic learning are good.

In the second indicator of learning culture in the indicator of students' interests and talents, it can be seen that the total score obtained from 4 statement items with a maximum score of 307, so that the percentage obtained is 75.75% with an average of 3.84, meaning that the talents and interests achieved by students according to Learning Outcomes are categorized as quite good.

The largest distribution of indicator scores is in the third indicator, namely the fun indicator, with an average score of 3.24 or under score indicator 1 And 2 can interpreted that program learning Polytechnic based on IT Not yet done with method Which pleasant.

Data analysis: Do IT-based learning facilities, learning environment, teaching materials methods and learning media meet needs?

Before answer statement the should We see Formerly that policy government start year 1980 Until 2019, the period connecting Polytechnic or vocational education to be directly absorbed by industry (link and match) is quite good, plus fiscal policies for companies Which prioritizing research and development as well as education Polytechnic or vocational through policy subtraction Income Got it Tax (tax allowance) above 100 percent. Polytechnic or vocational education began to be introduced with a curriculum that supports revolution industry Which has happen like ability analysis And solve problem (problem solving) through the development of media, teaching materials, learning methods and learning environments which are the functional professional domain of Learning Technology Developers (PTP).

Executive Director of the Center on Reform of Economics (CORE) Mohammad Faisal said that the manufacturing industry does benefit from the use of technology and the internet.

But according to the industry philosophy that the theory, industry Manufacturing must be the largest absorber of labor in a country, simply because technological disruption and the 4:0 industrial revolution have resulted in creating a time bomb of mass unemployment.

Developing Research and Development (R&D), if the basic problems are not met, for example logistics costs and price cheap energy, and is an important component of the previous industrial revolution, then technological disruption occurred.

"The principle of industry is to minimize costs, use robots and the internet aim for efficiency and product quality it would be better, but result in fare production become expensive And logistics cost Which tall so that competitiveness will not be optimal, this will result in R&D for the industrial revolution 4.0 not running.

In the history of Indonesia's development through Polytechnic Education, it must be able to play a role in the global market which is experiencing technological disruption due to the industrial revolution 4.0, if the gap... Professional ego still occurs in higher education where issues of education, research and community service are only the responsibility of lecturers, on the other hand learning programs which include design of methods, media, teaching materials, learning strategies and learning environments should be the functional duties of PTP

Minister of Research, Technology and Higher Education, Mohamad Nasir, echoed the importance of developing superior human resources (HR), matter This due to has happen shift importance source Power natural to invention And innovation Which

produced a nation in development social its economy, but matter ego profession in environment college tall Still very visible or occurring.

The availability of quality human resources in the sense of being rich in quality human capital, because they have successfully completed the Polytechnic applied postgraduate program according to the requirements, has resulted in innovation so that new policy findings have been found. Symptoms of this gap are shown by the comparison of gross participation rates. (APK) and pure (APM). APK is measured as the ratio between all students attending school at a certain level of education regardless of age, shared by resident in group age ideal a level, whereas APM is ratio between Students who are taking education at a level appropriate to their age group are divided into the population of the appropriate age group.

ASEAN Which more and more integrated in a way global chase revolution industry

0 increase welfare socio-economic its people, strength capital man become more and more important.

Matter This shown by development APK education tall (investment in HR increase access higher education. Singapore There is indeed no equal in investing in human resources because it is one of the seven countries most ready to enter Revolution Industry 4.03, Indonesia can it is said is at in group intermediate on level 30%, followed by Brunei And Vietnamese, on Cambodia, Laos And Myanmar Which Still in lower 20%, beside Thailand, Malaysia and the Philippines

The APK for higher education includes students who are currently studying at master's degree institutions, the majority of Indonesian students (in the sense of participants at higher education institutions) study higher education as undergraduate and polytechnic students who emphasize workers who have skills and expertise, as well as regulations on teaching requirements at the higher education level. Supporting the hope of being able to face the revolution industry 4.0 in competition era disruption technology And globalization No only through ability special which is obtained by completing a master's degree in higher education in produce responsive capabilities for industry 4.0 involvement but a very important element is determining a comprehensive integral policy for empowering Learning Technology Developers in one vision, mission for developing programs, teaching materials, media, learning methods and learning environments in higher education at the Polytechnic so that integrated management of various skills, expertise, interest groups is able to realize Industry 4.0

Analysis data whether means infrastructure learning based on IT, material teach, media And environment Study is it managed by the Learning Technology Developer function?

The definition explains that Polytechnic college staff have the best human resources, namely lecturers through education, study And devotion to public in develop learning it turns out Not yet able to answer challenge Which expected or meet expectations President And Minister of Research, Technology and Higher Education so that the Indonesian nation can become player Revolution Industry 4.0 Which capable save unemployment consequence disruption technology only Because shackled on ego profession or ego sectoral.

Indicator 11 PTP or 0.033% Which career as Developer Technology Learning in college tall matter This shows that it will be very difficult for PTP to make changes to the learning culture. The Ministry of Research, Technology and Higher Education can at least open PTP positions in the university environment (job description) to optimize the role of learning technology developers as a profession that manages various learning resources, media, teaching materials, and learning environments in every university in Indonesia.

There is Lots information from world Work or industry about a number of symptom Which related with system Polytechnic Education related to learning programs, that the "main objective" education Polytechnic, namely the management of learning programs, teaching materials, media, learning methods and learning environments is one of the important elements or component main Which influence quality education in to form HR become candidate power Work who have good "knowledge", attitude and mental set (outcome) from the learning process. Things that make it difficult to develop learning programs are as follows:

a. System recruitment And selection lecturer And functional certain Which only use method And tools selection that has not been able to capture skills or competencies in learning, research and community service.
b. The development of the capabilities of lecturers and certain functionalities, facilities and infrastructure, media, teaching materials and learning environment is still partial.
c. The culture of dual positions, overlapping tasks, authority and responsibilities at every level of office in the organization does not yet indicate a higher education institution that is professional, effective and efficient.
d. Development center source Study Good method, material teach, media learning And environment Study not yet the domain or duties of the Learning Technology

Developer (PTP)

On implementation plan performance annual or RKT covers target increase superiority And quality graduates through developing methods, teaching materials and learning media in accordance need stakeholders, the existence of standards method And media learning based on class And technology information, availability Curriculum, Graduate Competencies, Learning Achievements, Semester Learning Plans, and RPP Regulation of the Minister of State Apparatus Empowerment and Bureaucratic Reform Number: PER/2/M.PAN/3/2009, updated with number: 28 years

2017 concerning the Functional Developer of Learning Technology, Regulation of the Minister of Education and Culture Number 49 of 2018 concerning the technical instructions for the functional position of PTP" states that the functional position of Learning Technology Developer was formed to support the use of learning technology in education, especially in floating content/media/model/application based on technology And integrate technology technology model learning in activity learning for all levels/grades education. The main functional task of the Learning Technology Developer is to carry out analysis and assessment of technology systems/models. learning, , Prediction media learning, Implementation system/model And utilization media learning, Control of learning systems/models, Evaluation system/model implementation And utilization learning media for various levels/stages of education including higher education. As a result of professional ego, education during the Covid-19 pandemic has experienced... setback Because function PTP in 1). manufacture design system/model learning 2). Making standard service learning 3). Making Guidelines for managing learning systems/models 4). Making learning implementation instructions

4. CONCLUSION AND SUGGESTION

Conclusion

a. System learning Polytechnic in business increase superiority And quality graduate of Polytechnic in accordance vision, mission with learning system blended learning Which emphasize relatedness And compatibility (Link and match) Industry is needed role position functional Developer Technology Learning (PTP) in all over college tall as the management of various learning resources, methods, teaching materials, learning media and learning environments.
b. Indicators of learning culture, interests, talents and enjoyable learning require a comprehensive policy from the Ministry of Research, Technology and Higher Education to determine that PTP positions are very necessary in Higher Education.
c. The internal quality assurance system standards for education include graduate competencies, learning content, learning processes, evaluation learning, lecturer And power education, sapra learning, financing And others at the Polytechnic are needed for efforts to respond to the Industrial Revolution 4:0 and the challenge of overcoming mass unemployment due to the impact of technological disruption.
d. Number of higher education institutions (Polytechnics, Universities, Institutes, Colleges, Academies, Community Academies) in Indonesia not enough more 3310, whereas HR Which career as PTP in college tall only 11 or 0.033% of the total number of universities, this This It will be very difficult for PTP to encourage changes in learning culture in higher education.
e. For to abolish ego profession And ego sectoral in college tall in development program learning and in relation to the management of various learning resources, methods, teaching materials, media and learning environments according to interests, talents and enjoyable learning, urgent policy decisions are required between ministries.

Suggestion

In business overcome disruption technology so Outcome education Polytechnic No let go availability Curriculum, Graduate Competencies, Learning Achievements, Semester Learning Plans, and Learning Program Plans, Method Design, Teaching Materials, Learning Media and Learning Environment, then what needs to be done is as follows;

a. Empowering the duties and functions of Learning Technology Developers in all higher education, especially in Polytechnics

b. Eliminating the barriers of sectoral ego and ego profession specific to the vision and mission of developing university human resources.

REFERENCES

Achmad, B. (2005). *Thinking in SETS (Science, Environment, Technology, and Society)*. Semarang: Postgraduate Program, Unesa.

Bureau of Statistics. (1975, March). *Census resident 1971*. BPS.

Dear Sir, M. S. (2019, July 17). *Education now and time front* (p. 5). Retrieved from http://pendidikan.net

Journal of Devotion Public Progressing. (2019). *Volume 2, Number 2, May 2019*.

Karman. (2017, December 18). Internet technology disruption and the print media existence—Disruptive internet technology and the existence of print media. *Journal of Communication and Public Opinion Research*, *21*(2).

Ki Hahar, The Council of Ministers. (n.d.). *Education and culture* (p. 439). Yogyakarta: MLP Park Student.

Suryadi, M. (n.d.). Link and match need fundamental development of HR. *Journal of Education and Culture, 4*(013), 13.

Yafie, E., Nirmala, B., Kurniawaty, L., Bakri, T. S. M., Hani, A. B., & Setyaningsih, D. (2020). Supporting cognitive development through multimedia learning and scientific approach: An experimental study in preschool. *Universal Journal of Educational Research, 8*(11C), 113–123. https://doi.org/10.13189/ujer.2020.081715