Applying the Fuzzy Decision-Making Method for Program Evaluation and Management Policy of Vietnamese Higher Education

Hao Tong, Kiet and Nguyen, Quyen Le Hoang Thuy To and Thi Mong Nguyen, Tuyen and Nguyen, Phong Thanh and Bich Vu, Ngoc

Ho Chi Minh City Open University, Vietnam

3 July 2020

Applying the Fuzzy Decision-Making Method for Program Evaluation and Management Policy of Vietnamese Higher Education

Kiet Hao TONG[1], Quyen Le Hoang Thuy To NGUYEN[2*], Tuyen Thi Mong NGUYEN[3], Phong Thanh NGUYEN[4], Ngoc Bich VU[5]

[1] First Author, Director, Office of Human Resources, Ho Chi Minh City Open University, Vietnam. Email: kiet.th@ou.edu.vn

[2] Corresponding Author. Assistant Professor, Deputy Director, Office of Cooperation and Research Management, Ho Chi Minh City Open University, Vietnam [Postal Address: 97 Vo Van Tan Street, District 3, Ho Chi Minh City, 724000, Vietnam] Tel: +84 908252614, Email: quyen.nlhtt@ou.edu.vn

[3] Assistant Professor, Department of Fundamental Studies, Ho Chi Minh City Open University, Ho Chi Minh City, Vietnam. Email: tuyen.ntm@ou.edu.vn

[4] Assistant Professor, Department of Project Management, Ho Chi Minh City Open University, Vietnam. Email: phong.nt@ou.edu.vn

[5] Lecturer, School of Advanced Study, Ho Chi Minh City Open University, Vietnam. Email: ngoc.vb@ou.edu.vn

Abstract

Education policy is a dynamic process featuring social development trends. The world countries have focused their education program on empowering the learners for future life and work. This paper aims to assess the higher education curriculum based on a survey of 280 students, employers, alumni, and lecturers in both social sciences and natural sciences in Ho Chi Minh City, Vietnam. The fuzzy decision-making method, namely the Fuzzy Extent Analysis Method (F-EAM), was applied to measure the relative weight of each parameter. Seven factors under the curriculum development have been put in the ranking. Input with emphasis on foreign language was the highest priority in curriculum development, given the expected demand of the labor market. Objective and learning outcome and teaching activities ranked second and third, respectively. The traditional triangle of teaching content, methodology, and evaluation and assessment are still proven their roles, but certain modifications have been defined in the advanced curriculum. Teaching facilities had the least weight among the seven dimensions of curriculum development. The findings are helpful for education managers to efficiently allocate scarce resources to reform the curriculum to bridge the undergraduate quality gap between labor supply and demand, meeting the dynamic trends of social development.

1. Introduction

The human society has recently gone through the industrial revolution for more than hundreds of years (Campa, 2020; Choi, Kim, & Kim, 2019; Lee, 2019; Liang, 2018). Since the beginning of the industrial and technological revolutions, knowledge has been key to growth and development driving high value, creativity, and innovation (Bui, Nguyen, Tran, & Nguyen, 2020; Pham, Dao, Cho, Nguyen, & Pham-Hang, 2019; Serrat, 2017). Higher education has increasingly played a key role in preparing the graduates for rapidly changing economies, especially having the necessary competency to succeed in the 4.0 industry globally (Beamish, Armistead, Watkinson, & Armfield, 2002; Huynh, Nguyen, Nguyen, & Vu, 2020; Marginson, 2010; Qodim, Herningsih, Nguyen, Nguyen, & Toding, 2019; Ramakrishnan, Shabbir, Kassim, Nguyen, & Mavaluru, 2020).

Vietnam now faces adversity. Graduates have recorded high unemployment rates despite the increased market demand for skilled laborers (Trang, Tho, & Hong, 2017). With an average population of 94.66 million, the labor force shares 59.5%, of which the trained proportion is 21%. However, the trained labor force represents up to 41.9% of unemployment (Gammage, Sultana, & Glinski, 2020; Nguyen et al., 2020). This suggests that the social resources spent on education have not been used effectively (Ha, Le, & Trung-Kien, 2019; Nguyen & Khoa, 2019; Nguyen, Nguyen, Ngo, & Nguyen, 2019). As a result, whether higher education has been succeeding in preparing graduates has been debated. There is a mismatch between education and labor market demand. The curriculum, the backbone of the entire training process at a university, and which determines the learners' competency, includes three core dimensions: attitude (A), skills (S), and knowledge (K) (Duong, Nguyen, & Nguyen, 2020). This paper explored these components of the curriculum based on different curriculum development approaches, after which, the relative importance of each component is calculated based on the fuzzy extent analysis method (F-EAM). This will guide the development of solutions to the design for a more productive curriculum to meet the dynamic development trends.

2. Literature Review

The term "curriculum" first appeared in 1820 but was used professionally in the United States in the middle of the twentieth century (McBean & Feinberg, 2020; Percival, 2018; Tasdemir & Gazo, 2020). It originates from the Latin, "*Currere*," which means "to run a course." Therefore, the traditional definition of the curriculum has been "course of study." Over time, the concept of curriculum has been expanded and categorized into different disciplines: fundamental, technical, and practical, etc.

Machalow, Remillard, Van Steenbrugge, and Kim (2020) concluded that all modules and activities designed to equip learners with knowledge, skills, and attitudes to ensure that in the learning outcome, the graduates gain a comprehensive capacity labor market. It is a series of experiences built on a theoretical foundation, a research framework, past and present practice, which enhances learner self-discipline, critical thinking, and capabilities. In summary, a curriculum is a set of choices taught to improve a learners' competency (Puplampu & Mugo, 2020). This includes the content, pacing, sequencing, and evaluation (Katartzi & Hayward, 2020). Further, it refers to what should be taught and

how. The mechanism of selecting and reconstructing knowledge to meet the specific learning outcome is indicated. More specifically, the curriculum is composed of two core components: the subject and the temporal order of teaching activities (Amin, Almunawar, Hasnan, & Besar, 2020; Wentling, 1993). It can be structured into various elements, as summarized in Figure 1.
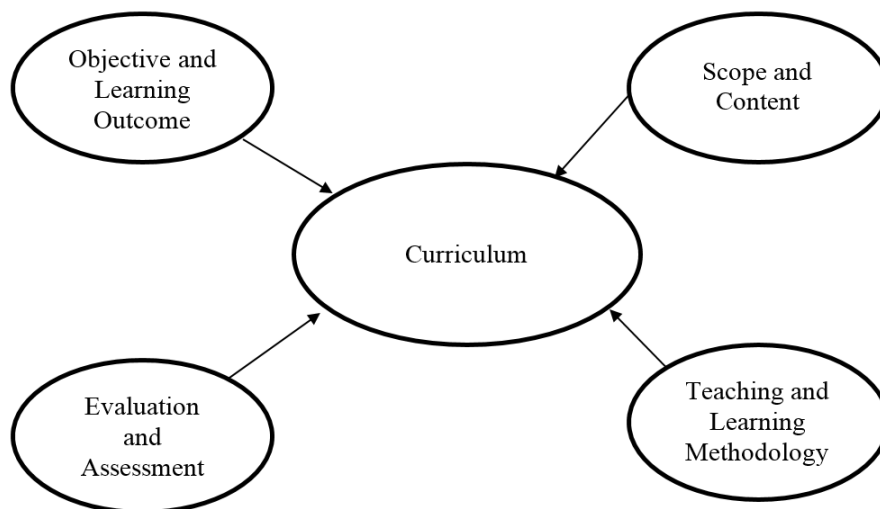

Figure 1: Curriculum structure

University educators can select several different approaches to curriculum development, but it is challenging to find a single approach-based curriculum. Often, besides a mainstream approach, it is possible to identify aspects of the different approaches' curriculum development such as the content-based approach, the objective-based approach, the development-based approach, and the competency-based approach (Abdullah et al., 2009).

The content-based approach is the traditional form of curriculum development. It puts the most weight on knowledge as it considers education as a knowledge transmission process (Cammarata, 2016; Stoller, 2004). In this view, the curriculum, in general, and the course, in particular, is an outline of the knowledge required for learners. It may be merely a table of contents of a book, not to mention teaching strategies and methodologies. As a consequence, the teacher only needs to find the right method to convey knowledge, putting learners in a passive position to receive knowledge. With this approach, education is simply considered the acquisition of knowledge (Trisnaningsih, Sutrisno, Permatasari, Hendra, & Sulistyowati, 2020). However, knowledge becomes out of date in an era of rapid technological change (Harliantara et al., 2020; Qodim et al., 2019). As a result, a mismatch between the graduates' capacity and labor market requirements develops.

Moreover, the disadvantages of this approach can be delineated. It is difficult to determine the specific goals of the curriculum. The course is intended for teachers and learners to achieve together. The consequence is the failure to determine standards for testing and evaluation of teaching and learning achievement. Also, the degree of completion of the curriculum by lecturers is rarely assessed, leading to the randomness when the curriculum and lectures are compiled outline. Teachers are not encouraged to be responsible for learners who receive knowledge nor its impact. Learners have become passive and dependent on the teacher to acquire knowledge. Their greatest concern is about the test.

As a remedy for the limitations of the content-based approach, an objective-based approach became popular in the mid-twentieth century in the United States (Tai & Li, 2006). The training objectives of this approach were to guide the proper content, methodologies, and evaluation for learners

to reach the targeted knowledge, skill, and attitude. As a result, much attention has been paid to creating output that is of equal quality. Therefore, the concept of "education technology" and "technology curriculum" has evolved (Nguyen, Nguyen, & Huynh, 2019; Nguyen, Nguyen, Huynh, & Le, 2020; Nguyen, Nguyen, Huynh, & Nguyen, 2020). Though this approach has proven to have much merit, some weaknesses have been identified. First, education is not merely a tool to create products like a production line, in which products (students) must meet pre-defined standards. Human education has been characterized by its specification, being incomparable at all aspects, using education technology with rigid objectives is difficult to maintain in the long term (Vu et al., 2019). Second, education is neither a process of transmitting knowledge nor of training learners according to defined goals. Its purpose is to develop people, help them maximize their potential so that they can adapt to an ever-changing life. However, the objective approach has failed to promote the abilities, interests, and needs of learners. In general, the objective approach creates a coherent, easy-to-evaluate, rigid, and rigorous training. However, there is no room for customizing a learner's experience to meet his or her unique needs.

The development-based approach gives priority to learners' knowledge development (Obeso, Phillipi, Degnon, & Carter, 2018). Thus, "how?" is more important than "what?". The process of educating is focused on developing the potential and capacity of the students. People cannot study a huge knowledge with endless change at school. The education mission is to equip the students with the ability to face change and have the skills to adapt during their working and personal lives. With this approach, education becomes development and curriculum is a process. Therefore, the focus of a training program is humanistic, which is also the starting point of curriculum design. This kind of training program provides the required knowledge blocks to gain competence, and learners, based on their needs, interests, knowledge, and experience and with the advice of the teacher, proactively build their program to meet their goals. This is the principle of "the learner-centered teaching method" with a teacher as an instructor for students' development. This approach is superior to the content-based and objective-based systems because it aims at cultivating the learner's proactivity, creativity, and problem-solving.

The competency-based approach emphasizes the combination of knowledge, skill, and attitude and organizes them into a professional application (Haddouchane, Bakkali, Ajana, & Gassemi, 2017). Therefore, the curriculum is built in coordination with a job profile, following the lead and the feedback from the labor market. This approach is typically flexible so that new information and knowledge can be incorporated. Course content is arranged by module or credit, and textbooks are for reference purposes. Competency-based teaching encourages the application of technology-based teaching activities into adaptable and diverse ways, such as group-based, individual-based, self-directed, and learner-customized learning.

Each of the above approaches has both its negative and positive features. Recently, the Vietnamese curriculum has been identified as having several drawbacks. The theoretical content is too onerous and is not practical and oriented toward employability. Besides, interpersonal skills and communication are restricted. Moreover, working in a team, thinking critically, and teaching values holistically, are not options. To eliminate the negative features of Vietnam's higher education, a didactic analysis has been used to provide a comprehensive analysis of the teaching and learning process. The big question is what is the educational objective, which is the key for curriculum development. Also, the inputs are important because they determine what and how to teach. The next steps are the process, the learning facilities, and teaching. Finally, proper evaluation and assessment are critical to confirm that the educational objectives are being reached (see Figure 2). Thus, the development of a competency-based curriculum for higher education in Vietnam will better meet the requirement of enhancing education quality. Various viewpoints and approaches to the model have to be explored to guide educators in the curriculum development process.
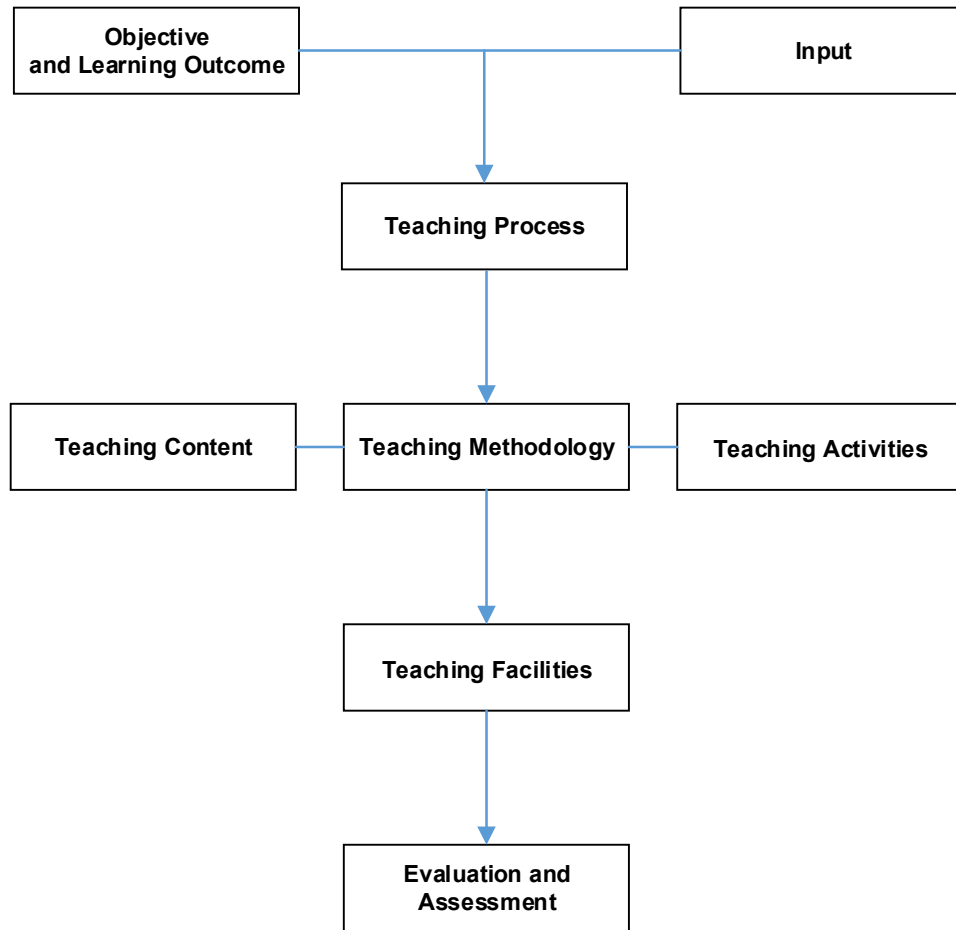
Figure 2: Curriculum Criteria

3. Research Methods and Materials

Fuzziness is a common feature of problems relating to decision-making problems along with the advantages of fuzzy logic (Jaukovic Jocic et al., 2020; Nguyen, Nguyen, Nguyen, & Huynh, 2019). Fuzzy logic is an algorithm that uses mathematical logic to solve the problem of imprecise input data values or the ambiguity of object classes based on the use of human judgment in order to reach an accurate conclusion (Phong, Phuc, & Quyen, 2017). Using a fuzzy extent analysis approach, a problem is decided by a range of values instead of a fixed value or number (Phong & Quyen, 2017). This is more realistic because it is often difficult for people to express their judgment clearly. After all, the process of comparison has such a fuzzy nature. The steps of the fuzzy extended analysis method under fuzzy environment are as follows (Bozbura, Beskese, & Kahraman, 2007; Nguyen, Nguyen, Nguyen, & Huynh, 2019):
Let

$Z = \{z_1, z_2, \ldots, z_n\}$ be an object set, and

$V = \{v_1, v_2, \ldots, v_m\}$ be an objective set.

Then, the extent analysis values for each ith object for goals are obtained and shown as follows:

$$\tilde{M}_{g_i}^{j}$$

where $i = 1, 2,..., n; j = 1, 2,..., m$

Step 1: Obtain priority weights
The value of fuzzy extended analysis synthetic on the ith is expressed as:

$$S_i = \left(\sum_{i=1}^{m} a_i , \sum_{i=1}^{m} b_i , \sum_{i=1}^{m} c_i \right) \otimes \left(\frac{1}{\sum_{i=1}^{n} c_i} , \frac{1}{\sum_{i=1}^{n} b_i} , \frac{1}{\sum_{i=1}^{n} a_i} \right)$$

(1)

Step 2: Comparing degrees of possibility
The degree of possibility of $N_2 \geq N_1$ is expressed as follows:
$V(N_2 \geq N_1)$

$$= \begin{cases} 1 & \text{if } b_2 \geq b_1 \\ 0 & \text{if } a_1 \geq c_2 \\ \dfrac{a_1 - c_2}{(b_2 - c_2) - (b_1 - a_1)} & \text{otherwise} \end{cases}$$

(2)

Step 3: Obtaining the weight vector
Assume that

$$d'(B_i) = \min V(T_i \geq T_k)$$

(3)

for $k = 1, 2,..., n; k \neq i$.
Then, the weight vector is given by:

$$W' = (d'(B_1), d'(B_2),..., d'(B_n))^{T}$$

(4)

where
B_i (i = 1,2,..., n) are n elements.

Step 4: Calculate the normalized weight vector

$$W = (d(B_1), d(B_2),..., d(B_n))^{T}$$

(5)

Step 5. Ranking of the components
After having components weights, the ranking of all components is known.

4. Results and Discussion

Based on the review of the curriculum criteria, a field survey was done. The involved stakeholders, including students, employers, alumnus, and lecturers in Ho Chi Minh City, were included in the interview process. A pilot survey revealed that the input "foreign language" was a significant concern in the Vietnamese context. This opinion was built into the questionnaire design. A total of 300 questionnaires were distributed to interviewees. Finally, 280 replies were received with an average response rate of 93.3%. A description of the study sample (N=280) is in Table 1.

Table 1: Description of the study sample.

No.	Sample	Student	Employer	Alumni	Lecturer	Total
1	Social sciences	45	15	60	20	140
2	Natural sciences	45	15	60	20	140
Total		90	30	120	40	280

The questionnaire was composed of seven elements and requested each express agreement or disagreement. The seven elements were: (i) input with the emphasis on foreign language, (ii) objective and learning outcomes, (iii) teaching content, (iv) teaching methodology, (v) teaching activities, (vi) teaching facilities, and (vii) evaluation and assessment. The rank of the curriculum's components under fuzzy extended analysis method is summarized in Table 2.

Table 2: Ranking the curriculum's components

Components	Score	Rank
Input with emphasis on foreign language	0.1847	1
Objective and learning outcome	0.1744	2
Teaching activities	0.1740	3
Teaching content	0.1621	4
Teaching methodology	0.1439	5
Evaluation and assessment	0.0987	6
Teaching facilities	0.0622	7

Vietnam seeks to integrate with the world economic system (Dhahad, Hussen, Nguyen, Ghaebi, & Ashraf, 2020; Nguyen & Ngoc, 2020; Nguyen, Quan, Le, & Van, 2020; To, Ha, Nguyen, & Vo, 2019). Therefore, the requirement of foreign languages, especially English, was the leading factor for assessing the quality of labor resources. The research finding confirmed that English was the highest priority for designing the curriculum. This was consistent with a survey done by the Department of Higher Education, Vietnamese Ministry of Education and Training at 18 Vietnamese universities, showing that the average freshmen score on the TOECIC ranged from 220-245 /990. About 360 hours of training has been suggested to achieve 450-500 TOEIC points — the minimum level that employers will accept.

Objective and learning outcomes were the second criterium, covering what to learn (attitude, skill, and knowledge). It was the start as well as the end of the pedagogical process, which determines three critical areas: behavior (what to do), context (how to do), and the result (what level to be achieved). Given the actual qualifications of the undergraduates, learning outcomes should focus on practical aspects to enrich the learner's professional skills. Critical thinking, collaboration, and problem are also in high demand. This is also the guideline for teaching activities and content, which were ranked third and fourth, respectively.

Courses referred to as teaching content, are components of the curriculum. They are considered as the bricks and the wall is the curriculum. It is well-known that the walls of solid houses need qualified bricks. In the curriculum, either a general or a specific one, each course has its position or role in providing certain knowledge for learners, and through the transmission of knowledge in each course, the learners' competency has been reached. The empirical result implies that they are redundant courses in the current curriculum at higher education institutions in Vietnam. Moreover, certain required subjects have insufficiently contributed to the targeted learning outcomes. In fact, up to 47.3% of the undergraduates who have gone on to work in the industry revealed that the knowledge and skills they had acquired were not useful for the work they are now doing. On the contrary, much of the knowledge required by the employers was not provided in the universities. Therefore, the concept of teaching content should be guided by learner's competency and replaced by modules in advanced curriculum development. The teaching methodology was associated with teaching content and realizing the targeted objective and learning outcome. The combination of various teaching methods should be properly applied in each module. For instance, presentation, homework, seminar, group discussion, etc. are quite common for the theoretical module. In a practical module, problem-solving, work-based projects, reports, essays, interviews, etc. have helped develop the learner's career experience. The improvement of the two components can be useful in bridging the quality gap between labor supply and demand.

Evaluation and assessment is also a key component in curriculum practice. Several involved stakeholders such as employers, teachers, administrators, learners, etc. have expressed concern that it contributes to the effective operation of a curriculum. However, these were ranked sixth among the seven dimensions in this study. The justification for such an order is that the benefits from assessment and evaluation can only be achieved with the proper design of the other components, including objective and learning outcomes, teaching content, and methodologies (Mikre, 2010). Finally, teaching facilities require the greatest investment within the educational system. They are the physical resources that impact on the learner's achievement. Poor facilities may lead to less effective implementation of the curriculum. However, it was given the least weight among the seven factors in the view of the experts in the Vietnamese higher education context. Resource inadequacies often have been solved by facility co-sharing agreements.

5. Conclusions

The study explored the importance of curriculum components in making efficient and effective measures to improve education. In Vietnam, English is the first consideration in curriculum design and development, followed by other criteria such as objective and learning outcomes, teaching content, teaching methodology, and evaluation and assessment. An impressive finding was those teaching facilities were weighted as the least important component because of the current practice of co-sharing agreements. This can may be important for higher education institutions in other developing countries.

References

Abdullah, S., Rahmat, R. A. A. O. K., Zaharim, A., Muhamad, N., Deros, B. M., Kofli, N. T., Azhari, C. H. (2009). Implementing continual review of programme educational objectives and outcomes for obe curriculum based on stakeholders' input. *European Journal of Scientific Research, 29*(1), 89-99.

Amin, N. A. N., Almunawar, M. N., Hasnan, A. S., & Besar, N. N. (2020). The utilization of web 2.0 for knowledge sharing: The case of tertiary education in brunei darussalam. In *Handbook of Research on Managerial Practices and Disruptive Innovation in Asia* (pp. 1-25). Hershey, PA: IGI Global.

Beamish, N., Armistead, C., Watkinson, M., & Armfield, G. (2002). The deployment of e-learning in uk/european corporate organisations. *European Business Journal, 14*(3), 342-350.

Bozbura, F. T., Beskese, A., & Kahraman, C. (2007). Prioritization of human capital measurement indicators using fuzzy ahp. *Expert Systems with Applications, 32*(4), 1100-1112.

Bui, K. T., Nguyen, H. M., Tran, N. V. H., & Nguyen, B. H. (2020). Lecturers' adoption to use the online learning management system (lms): Empirical evidence from tam2 model for vietnam. *Journal of Science HCMCOU-Economics And Business Administration, 10*(1). DOI: 10.46223/HCMCOUJS.econ.en.10.1.216.2020

Cammarata, L. (2016). *Content-based foreign language teaching: Curriculum and pedagogy for developing advanced thinking and literacy skills*. Abingdon, UK: Routledge.

Campa, R. (2020). Fourth industrial revolution and emotional intelligence: A conceptual and scientometric analysis. *Changing Societies and Personalities, 4*(1), 8-30. doi:10.15826/CSP.2020.4.1.087

Choi, C., Kim, C., & Kim, C. (2019). Towards sustainable environmental policy and management in the fourth industrial revolution: Evidence from big data analytics. *Journal of Asian Finance, Economics and Business, 6*(3), 185-192. doi:10.13106/jafeb.2019.vol6.no3.185

Dhahad, H. A., Hussen, H. M., Nguyen, P. T., Ghaebi, H., & Ashraf, M. A. (2020). Thermodynamic and thermoeconomic analysis of innovative integration of kalina and absorption refrigeration cycles for simultaneously cooling and power generation. *Energy Conversion and Management, 203,* 112241. doi:10.1016/j.enconman.2019.112241

Duong, M. T. H., Nguyen, D., & Nguyen, P. T. (2020). Using fuzzy approach to model skill shortage in vietnam's labor market in the context of industry 4.0. *Engineering, Technology & Applied Science Research, 10*(3), 5864-5868.

Gammage, S., Sultana, N., & Glinski, A. (2020). Reducing vulnerable employment: Is there a role for reproductive health, social protection, and labor market policy? *Feminist Economics, 26*(1), 121-153.

Ha, N. M., Le, N. D., & Trung-Kien, P. (2019). The impact of urbanization on income inequality: A study in vietnam. *Journal of Risk and Financial Management, 12*(3), 14. doi:10.3390/jrfm12030146

Haddouchane, Z. A., Bakkali, S., Ajana, S., & Gassemi, K. (2017). The application of the competency-based approach to assess the training and employment adequacy problem. *International Journal of Education, 5*(1). DOI: 10.5121/ije.2017.5101 Available at: https://arxiv.org/ftp/arxiv/papers/1704/1704.04985.pdf

Harliantara, Saehu, M. S., Indarti, S., Syaifuddin, Nguyen, P. T., & Ajmain Jima'Ain, M. T. (2020). Quality service competition in education. *International Journal of Psychosocial Rehabilitation, 24*(8), 1513-1517.

Huynh, V. D. B., Nguyen, P. T., Nguyen, Q. L. H. T. T., & Vu, N. B. (2020). E-learning evolution and

development from the perspectives of technology, education, and economy. *Research in World Economy, 11*(1), 11-19. doi:10.5430/rwe.v11n1p11

Jaukovic Jocic, K., Jocic, G., Karabasevic, D., Popovic, G., Stanujkic, D., Zavadskas, E. K., & Thanh Nguyen, P. (2020). A novel integrated piprecia–interval-valued triangular fuzzy aras model: E-learning course selection. *Symmetry, 12*(6), 928. https://doi.org/10.3390/sym12060928

Katartzi, E., & Hayward, G. (2020). Conceptualising transitions from vocational to higher education: Bringing together bourdieu and bernstein. *British Journal of Sociology of Education, 41*(3), 299-314.

Lee, J. W. (2019). Lagged effect of exports, industrialization and urbanization on carbon footprint in southeast asia. *International Journal of Sustainable Development and World Ecology, 26*(5), 398-405. doi:10.1080/13504509.2019.1605425

Liang, J. (2018). *The demographics of innovation: Why demographics is a key to the innovation race.* Hoboken, NJ: John Wiley & Sons.

Machalow, R., Remillard, J. T., Van Steenbrugge, H., & Kim, O.-K. (2020). How curriculum materials support teachers' noticing of student thinking. In *Elementary Mathematics Curriculum Materials* (pp. 195-226). New York, NY: Springer Publishing.

Marginson, S. (2010). Higher education in the global knowledge economy. *Procedia-Social and Behavioral Sciences, 2*(5), 6962-6980.

McBean, T. R., & Feinberg, J. R. (2020). Critically examining virtual history curriculum. *Journal of Social Studies Research, 44*(1), 61-76. doi:10.1016/j.jssr.2019.08.002

Mikre, F. (2010). The roles of assessment in curriculum practice and enhancement of learning. *Ethiopian Journal of Education and Sciences, 5*(2). DOI: 10.4314/ejesc.v5i2.65376

Nguyen, H. M., & Khoa, B. T. (2019). The relationship between the perceived mental benefits, online trust, and personal information disclosure in online shopping. *Journal of Asian Finance, Economics and Business, 6*(4), 261-270. doi:10.13106/jafeb.2019.vol6.no4.261

Nguyen, H. M., & Ngoc, B. H. (2020). Energy consumption - economic growth nexus in vietnam: An ardl approach with a structural break. *Journal of Asian Finance, Economics and Business, 7*(1), 101-110. doi:10.13106/jafeb.2020.vol7.no1.101

Nguyen, H. M., Nguyen, C., Ngo, T. T., & Nguyen, L. V. (2019). The effects of job crafting on work engagement and work performance: A study of vietnamese commercial banks. *Journal of Asian Finance, Economics and Business, 6*(2), 189-201. doi:10.13106/jafeb.2019.vol6.no2.189

Nguyen, H. M., Quan, B. Q. M., Le, H. V., & Van Tran, T. (2020). Determinants of intra-industry trade between vietnam and countries in tpp. *Journal of Asian Finance, Economics and Business, 7*(1), 123-129. doi:10.13106/jafeb.2020.vol7.no1.123

Nguyen, P. V., Nguyen, P. T., Nguyen, Q. L. H. T. T., & Huynh, V. D. B. (2019). Extended fuzzy analytical hierarchy process approach in determinants of employees' competencies in the fourth industrial revolution. *International Journal of Advanced Computer Science and Applications, 10*(4), 150-154.

Nguyen, Q. L. H. T. T., Nguyen, P. T., & Huynh, V. D. B. (2019). Roles of e-learning in higher education. *Journal of Critical Reviews, 6*(4), 7-13. doi:10.22159/jcr.06.04.02

Nguyen, Q. L. H. T. T., Nguyen, P. T., Huynh, V. D. B., & Le, L. P. (2020). International experience and trends in e-learnmg development in world economy. *Research in World Economy, 11*(SI.1), 259-267. doi:10.5430/rwe.v11n1p259

Nguyen, Q. L. H. T. T., Nguyen, P. T., Huynh, V. D. B., & Nguyen, L. T. (2020). Application chang's extent analysis method for ranking barriers in the e-learning model based on multi-stakeholder decision making. *Universal Journal of Educational Research, 8*(5), 1759-1766.

doi:10.13189/ujer.2020.080512

Nguyen, Q. L. H. T. T., Nguyen, P. V., Nguyen, P. T., & Huynh, V. D. B. (2019). Using fuzzy logic to develop employees' competency ranking model. *The Journal of Social Sciences Research, 5*(4), 888-891.

Nguyen, T. Q., Nguyen, A. T., Tran, A. L., Le, H. T., Le, H. H. T., & Vu, L. P. (2020). Do workers benefit from on-the-job training? New evidence from matched employer-employee data. *Finance Research Letters*, 101664. [In Press] https://doi.org/10.1016/j.frl.2020.101664

Obeso, V. T., Phillipi, C. A., Degnon, C. A., & Carter, T. J. (2018). A systems-based approach to curriculum development and assessment of core entrustable professional activities in undergraduate medical education. *Medical Science Educator, 28*(2), 407-416.

Percival, J. (2018). History and its links across the curriculum. *Education 3-13, 46*(6), 712-727. doi:10.1080/03004279.2018.1483805

Pham, H. C., Dao, N. N., Cho, S., Nguyen, P. T., & Pham-Hang, A. T. (2019). Construction hazard investigation leveraging object anatomization on an augmented photoreality platform. *Applied Sciences, 9*(21). doi:10.3390/app9214477

Phong, N. T., & Quyen, N. L. H. T. T. (2017). *Application fuzzy multi-attribute decision analysis method to prioritize project success criteria.* Paper presented at the AIP Conference Proceedings.

Phong, T. N., Phuc, V. N., & Quyen, T. T. H. L. N. (2017) Application of fuzzy analytic network process and topsis method for material supplier selection. In*: Key Engineering Materials Vol. 728* (pp. 411-415). https://doi.org/10.4028/www.scientific.net/KEM.728.411

Puplampu, K. P., & Mugo, S. M. (2020). Disruptive technology and knowledge development: African universities, human capital and educating for global citizenship. In: *Disruptive Technologies, Innovation and Development in Africa* (pp. 147-169). New York, NY: Springer Publishing.

Qodim, H., Herningsih, Nguyen, P. T., Nguyen, Q. L. H. T. T., & Toding, A. (2019). Educating the information integration using contextual knowledge and ontology merging in advanced levels. *International Journal of Higher Education, 8*(8), 24-29. doi:10.5430/ijhe.v8n8p24

Ramakrishnan, J., Shabbir, M. S., Kassim, N. M., Nguyen, P. T., & Mavaluru, D. (2020). A comprehensive and systematic review of the network virtualization techniques in the iot. *International Journal of Communication Systems, 33*(7), e4331. https://doi.org/10.1002/dac.4331

Serrat, O. (2017). Harnessing creativity and innovation in the workplace. In: *Knowledge Solutions* (pp. 903-910). New York, NY: Springer Publishing.

Stoller, F. L. (2004). 12. Content-based instruction: Perspectives on curriculum planning. *Annual Review of Applied Linguistics, 24*, 261-283. https://doi.org/10.1017/S0267190504000108

Tai, D. W., & Li, T. (2006). The objective-based curriculum design for technological and vocational schools in taiwan. *World Transactions on Engineering and Technology Education, 5*(3), 501. Available at: http://www.wiete.com.au/journals/WTE&TE/Pages/Vol.5,%20No.3%20(2006)/28_TaiLi35.pdf

Tasdemir, C., & Gazo, R. (2020). Integrating sustainability into higher education curriculum through a transdisciplinary perspective. *Journal of Cleaner Production, 265,* 121759. https://doi.org/10.1016/j.jclepro.2020.121759

To, A. H., Ha, D. T. T., Nguyen, H. M., & Vo, D. H. (2019). The impact of foreign direct investment on environment degradation: Evidence from emerging markets in asia. *International Journal of Environmental Research and Public Health, 16*(9), 1636. https://doi.org/10.3390/ijerph16091636

Trang, N. T. N., Tho, T. N., & Hong, D. T. T. (2017). The impact of oil price on the growth, inflation, unemployment and budget deficit of vietnam. *International Journal of Energy Economics and Policy, 7*(3), 42-49.

Trisnaningsih, S., Sutrisno, S., Permatasari, Y., Hendra, F. H., & Sulistyowati, E. (2020). Contingency model to increase the uptake of higher education graduates in the job market. *Journal of Asian Finance, Economics and Business, 7*(4), 197-203. doi:10.13106/Jafeb.2020.vol7.no4.197

Vu, D. H., Nguyen, P. T., Nguyen, Q. L. H. T. T., Huynh, V. D. B., Le, Q. T. T., Doan, T. H. D., Le, B. G. P. (2019). Success factors framework for the implementation of e-learning systems in vietnamese universities. *Journal of Critical Reviews, 6*(4), 1-6. doi:10.22159/jcr.06.04.01

Wentling, T. (1993). *Planning for effective training: A guide to curriculum development.* Rome, Italy: Food and Agricultural Organization of the United Nation. https://agris.fao.org/agris-search/search.do?recordID=XF2016042814