Ilearning Curriculum Of Information System Major Using OBE Methods

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Abstract

The curriculum has an important role to achieve the educational goals and competencies of graduates, so it is hoped that graduates of the study program will have comparative advantages, high quality and competitiveness in the present industrial era. However, the use of technology is also the development of innovation that is very fast causing a gap between education and human resource needs in the industrial world and society. While there are still many universities that only prioritize their curriculum which rarely correlates with what is in society. Outcome-based education (OBE) is a result-based learning approach, where students focus on the results to be achieved. The process that occurs in OBE is when the curriculum preparation will be adjusted to the learning process and student assessment, the results will be applied to the environment. In this study, researchers wanted to develop an Information Systems curriculum using Outcome-based education (OBE), by developing in areas that received less attention, but were needed in today's industry. Such as information systems on cryptographic security, project management, and web development. The application of OBE is in accordance with the contents of the National Higher Education Standards regarding learning content standards which are the minimum criteria for the level of depth and breadth of learning material.

Keywords: *Curriculum, Information System, OBE.*

1. Introduction

Information System (SI) curriculum looks standard at various universities but has variations in curriculum specifications[1]. Mandatory courses at one university Required not in another[2]. Because of these variations, the Information Systems curriculum became diverse [3]. With this diversity, the industry would also like the curriculum applied at the University to produce professional reforms in the field of Information Systems and they might also ask for a specific curriculum that would help them with employees who work in their companies[4].

This research develops Information Systems curriculum using Outcome-Based Education (OBE) or learning methods that provide a foundation for achievement of students about what can be done[5]. At OBE, learning outcomes or outcomes are identified first then planning learning methods and assessments are adjusted to outcomes [6]. OBE is a result-oriented approach where the product defines the process [7]. This learning system is an assessment system implemented by international accreditation including ABET. This learning-based education system is also in accordance with government regulations, which require study program curriculum to be in accordance with KKNI and SN-Dikti[8]. This research is a step towards improving and developing the quality of an educational institution, because as stated by De

Grauwe & Naidoo (2004) evaluating the quality of schools or universities involves assessing all aspects of the school and its impact on students to identify the quality of education in schools [9].

This system is different from the traditional learning method where the topic taught is determined by the supporting lecturer then from this topic the outcomes will be identified. A number of processes through OBE include curriculum design, assessment and teaching and learning methods that give students a foundation for what they can do. Students will be given teaching by emphasizing Learning Outcomes and academic completeness in the form of lectures, final assignments, presentations, tests and student portfolios [10].

In traditional learning, students are dependent on teaching staff where the outcomes are measured from the results of teaching and learning outcomes [11], [12]. Measurements are made after the teaching and learning process is finished, which in this case has a weakness that not all the achievements set in the course will be achieved. Results-oriented learning methods are currently lacking and have not even been implemented in Indonesia and have been implemented in several countries [13]–[16]. The application of OBE is also supported by information technology facilities [17]–[19]. Based on the reasons above, this research is proposed. By adopting output-oriented learning methods and systems, it is expected to improve the quality of education, especially in the Information Systems Study Program in general in Indonesia.

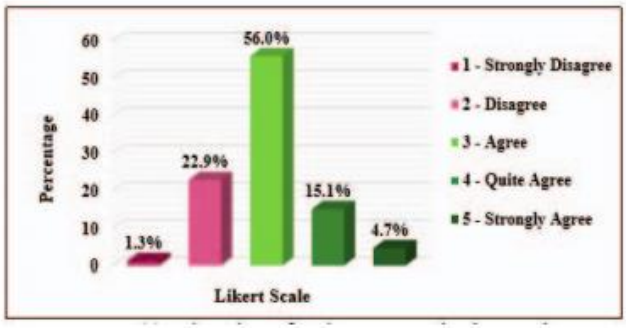

Figure 1.1 The Percentage of OBE Implementation

Figure 1.1 is a graph of the percentage of OBE implementation carried out at a university called ITS in Indonesia. The Guidebook Outcomes Based Education book states that OBE is structured with the aim of designing results and processing many things related to learning

2. Review of Literature and Foundation Theory

In this study the authors used the literature study method. The Related Literature method is a method of understanding several books, journals, notes relating to the problem that must be solved. The following 10 (ten) literary studies related to "iLearning Curriculum from Information Systems using the OBE Method":
Research by Jia Yue (2019), this journal the author explains about the concept of OBE-CDIO education in further education, with the aim of developing a rational curriculum and achieving increased

development of training programs, to achieve an expected outcome. Based on the OBE concept, the desired learning outcomes are professional level and curriculum level[20].

JiahuaZao, Han Gao, Peng Li (2019) wrote about how to avoid problems in traditional teaching and learning methods to fit the teaching style in the classroom, also to foster talent in accordance with the industry that is currently developing. OBE emphasizes students' practical abilities and has a strong theoretical foundation, and the selection of hybrid case-based teaching models avoids the disadvantages of traditional tracking teaching [19].

In the book by author HaiyiJin (2019), it describes the development of high-quality applied talent, network planning and design courses are redesigned following the principles of backward design, with a combination of Results-Based Education (OBE) and CDIO engineering education. mode [21].

The book by Jia Yue (2018), the author explains about transplanting basic frameworks and OBE-CDIO ideas, forming a teaching mode that is typical of scientific inquiry [22].

Research by Liping Li, et al (2019), explains the teaching objectives, graduation requirements and supporting indicator points of the OBE-based software project management curriculum and uses new reforms [23].

Research conducted by Jianguo Chen, et al (2019), the author describes results-based education (OBE) for technical education accreditation, also investigates the relationship between training objectives, graduation requirements and curriculum objectives, and explains that the curriculum must be optimized with ideas and new ways [24].

Tauseef Mubeen, et al (2019) wrote a book, in the book the author explains about the "Learning and Education Management System" (TALEM System) which bridges the gap between national and international education standards by providing implementation of Results-Based Education (OBE) systems and to accelerate integration IT in the education system [25].

Journal by Nor Irwin Basir (2017), the author describes the investigation of the problems involved in aligning iCGPA with the PO OBE Achievement system for the Engineering Degree program, especially in the various reference points and methodologies used to calculate achievement results [26].

Research by R Parkavi (2016), the author writes about explaining detailed surveys to improve teaching and learning in Information Technology (IT) courses using ICT tools and Active Learning Strategies (ALS) to implement Outcome Based Education (OBE).

Research by Hossein Zeynal, et al (2017), in his book he explained about the strategic and efficient implementation of OBE-BZTE that enables increased flexibility and management of educational processes [[27].

A case study by Umakant Kulkarni (2016) discusses how the application of OBE affects the gap between higher education and existing cases in society. Kulkarni et al, said that the lack of qualified graduates was caused by the lack of quality of study programs, teaching methodologies, as well as assessment and evaluation techniques in learning [28]

A study by K. Sudheer (2016) discusses how to teach with the OBE method based on the expected results. K. Sudheer uses the OBE method to evaluate the level of achievement of student learning outcomes [29].

Zulfaa Mohamed-Kassim (2017) published research on the launch of the OBE system that is able to extract student learning outcomes. In this case the assessment used and the evaluation given to students must be viewed from various sides, according to the implementation of the OBE method [30].

Abhya Tiwari (2018) conducted a research whose object was an engineering graduate. In his research Abhya discusses the challenges and improvements needed in the curriculum so as to produce quality

graduates. This refers to the number of engineering graduates who are unemployed due to lack of skills as well as direct training during college.

3. Research Methods

In this study, the OBE method is used as a course content where students can be reviewed for course content with specific learning outcomes during college. OBE is a Teaching-Learning Method where the University will introduce innovative learning to students. By using OBE, the assessment is varied and not monotonous in achievement. That way the quality of students will continue to develop further and.

The method used in this research is data collection directly surveying the university curriculum around and the program curriculum as described on the website. This data collection is used to design and provide many curriculum references that will be implemented in the Information Systems Study Program at Raharja University. The implementation of the research begins by selecting a number of Subjects (MK) from the Information System curriculum to be studied.

This research process has two stages. The main stage is data collection and the second stage is through data mapping. Data collection was conducted from November 2019 to December 2019. Data was collected including: University Name, Information Systems Curriculum, and Learning Outcomes. General data on information about each university was also collected.

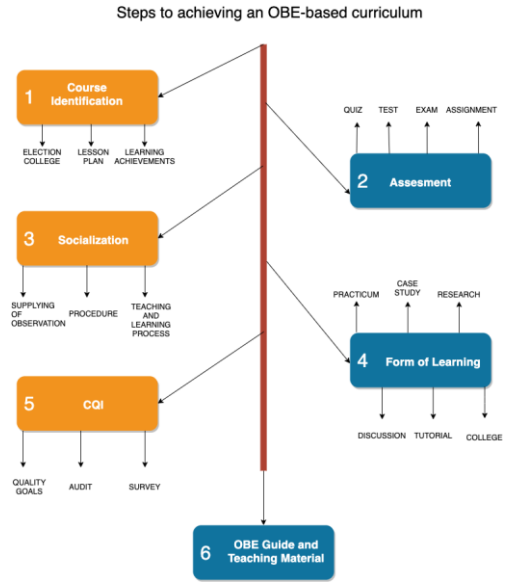

Figure 3.1 Step OBE Guide

Figure 3.1 explain step by step OBE Guide from the beginning of the course introduction to produce OBE Guide and Teaching Material. So that when implemented, students can understand the assessment procedures and tasks and achievements that will be done and can achieve maximum results.

The second stage is mapping data and approaches. With the following 5 (five) step or mechanism:

a. First, through Supervision and Reports on Achieving Quality Targets, and Performance Reports per semester conducted by the Dean of the University.

b. Second, Internal Audit. In accordance with the requirements in the quality management system, internal and external audits are conducted.

c. Third, Management Review. Conduct a management review of all matters relating to curriculum development.

d. Fourth, Customer satisfaction survey. Internal and external customer satisfaction surveys are conducted periodically, for example: a survey of teaching and learning processes carried out per semester for all subjects and per lecturer. The survey results are the supervision of the leadership for the teaching and learning process carried out per semester.

e. Fifth, Supervision using information systems. Supervision is carried out through IT-based control and supervision systems that have been built systematically at University of Raharja.

Through this system, university leaders, faculties, directorates and study programs can monitor the implementation of activities in their units. For example, for the teaching and learning process, through academic information systems, the accuracy of lecturer entry, and the suitability of lectures can be monitored[31]. We can use a Decision Support System for Student Ratings so that the final assessment or student results can be properly registered [32]. Quality achievement reports, performance reports, customer satisfaction survey results, user satisfaction surveys, results of internal and external audit reports are compiled and analyzed by the Quality Assurance Center. All monitoring elements and various reports above, serve as material for conducting corrective actions, as well as organizational self-evaluation in determining or setting the next year's quality goals.

The role of the lecturer is very influential in the level of student motivation. Lecturers must understand the concept of skills as well as the process of digitizing student assessments so as to produce an effective and efficient system [33]. The study currently conducts surveys directly at universities that have an Information Systems Study Program and takes a quantitative approach. Starting with a list of accredited A universities, those universities are reviewed from those who have a Management Information System (SIM) / Registered Information System program.

4. Result and Discussion

The study was conducted by surveying several universities that have Information Systems Study Programs and their curriculum. At the time the research began, there were 5 accredited universities / colleges. Of these, 4 universities have several types of computational education programs. This number contains private universities located in Tangerang Raya. Among these universities, 5 (five) or all have clear references to the courses on their website.

The following Information System Curriculum is presented with 3 concentrations, namely:

1. Business Intelligence

CURRICULUM OF THE ACADEMIC YEAR INFORMATION SYSTEM STUDY PROGRAM
Curriculum ID: 1244 Study Program: Information System
Concentration: Business Intelligence

SEMESTER 1			SEMESTER 2			SEMESTER 3			SEMESTER 4		
Code	Course	SKS	Code	Course	SKS	Code	Course	SKS	Code	Course	SKS
UL111	Religion	3	BL103	Indonesian Language	3	SL301	Analysis Business Procces	3	SL601	IT Research	3
BL101	English For IT	3	BL102	English For IT II	3	EL104	Basic Business Mangement	2	UR204	Community Service Program (KKN)	3
UL101	Pancasila and Nationality	3	UL102	Indonesian Lectures	3	TL201	Data Communication	3	DL201	Database System	3
ML101	Algebra Linear	3	AL101	Accounting I	3	SL401	Object Oriented Analysis and Design	3	SL501	Operating System	3
LL101	Logic and Algorithm	3	SL101	Information System Concept	3	DL101	Data Structure	3	PL401	Advanced Programming	3
PL101	Niaga Program Package	3	ML301	Statistics	3	IL101	Independent Study	3	PL701	Internet and E-Commerce	3
PL102	Introduction to Information Technology	3	UL501	Professional Ethics	3	PL301	Programming	3	TL301	Computer Organization	3
									UL301	Entrepreneurship	3
	SKS 21			SKS 21			SKS 21			SKS 24	

SEMESTER 5			SEMESTER 6			SEMESTER 7			SEMESTER 8		
Code	Course	SKS	Code	Course	SKS	Code	Course	SKS	Code	Course	SKS
ML601	Management Science	3	SL701	Management Project	3	PL501	Testing and Implementation	3	TA101	Essay	6
AL401	Accounting Information	3	SL111	Information System Mangement	3	IL201	Practice Lecture (KKP)	3			
DL401	Data Warehouse	3	TL601	Human Interaction and Computer	3	SL131	Decision Support System	3			
DL301	Database Design	3	TL401	Network Computing	3	QL100	Business Intelligence	3			
PL601	Homepage Design	3	SL801	Software Engineering	3						
PL801	Web Programming I	3	ML501	Mathematics Economy	3						
			PL901	Web Programming II	3						
			SL121	Computers and Community							
	SKS 21			SKS 24			SKS 12			SKS 6	

Figure 4.1 Business Intelligence Curriculum

Figure 4.1 contains the Business Intelligence concentration information system curriculum.

2. Management information System

CURRICULUM OF THE ACADEMIC YEAR INFORMATION SYSTEM STUDY PROGRAM
Curriculum ID: 1244 Study Program: Information System
Concentration: Management Information System

SEMESTER 1			SEMESTER 2			SEMESTER 3			SEMESTER 4		
Code	Course	SKS	Code	Course	SKS	Code	Course	SKS	Code	Course	SKS
UL111	Religion	3	BL103	Indonesian Language	3	SI103	Analysis Information System	3	UM140	Nationality 2	2
BL101	English For IT	3	BL102	English II	3	MT112	Calculus II	2	MJ110	Management Project	2
UL101	Pancasila and Nationality	3	MT111	Calculus I	3	MT131	Statistics Probability	3	SI138	Database System	3
ML101	Algebra Linear	3	SI350	System Information Concept	3	SI330	Analysis Procces Business	2	JR111	Network Computing	3
LL101	Logic and Algorithm	3	SI320	KNowledge 2 Business	3	SI152	Data Communication	2	SI131	Operating System	3
PL101	Niaga Program Package	3	MT121	Statistic Descriptive	3	SI171	Data Structure	3	PR202	Programming II	3
PL102	Introduction to Information Technology	3	SI161	Accounting I	3	PR201	Programming I	3	MJ203	Entrepreneurship	3
			TI171	Organization computer I	2						
	SKS 20			SKS 23			SKS 18			SKS 19	

SEMESTER 5			SEMESTER 6			SEMESTER 7			SEMESTER 8		
Code	Course	SKS	Code	Course	SKS	Code	Course	SKS	Code	Course	SKS
SI340	Management Science	3	HP100	Patent and Trademark Law	3	MJ175	Office Management	2	TI220	Human and Computer Interaction	3
SI111	Design Information System	3	MJ172	IT Research	3	SI221	Testing and Implementation	3	TA101	Essay	3
SI142	Data Warehouse	3	SI121	Management Information System	3	KP100	Job Training Lecture (KKP)	2	MJ200	Professional Ethics	3
MT185	Management Marketing	2	EK131	Economic Math	3	SI360	Decision Support System	2	MJ201	Algebra Linear	3
SI139	Database Design	3	MJ183	Software Engineering	3	MT163	Taxing	3			
PR183	Homepage Design	3	SI311	DBMS Programming	3	SI283	Web Programming	3			
PR203	Progamming III	3	MJ202	Computers and Sociely	3						
	SKS 20			SKS 19			SKS 17			SKS 12	

Figure 4.2 Management Information System Curriculum

Figure 4.2 contains an Information Systems curriculum with a concentration in Management Information Systems.

3. Accounting computer

CURRICULUM OF THE ACADEMIC YEAR INFORMATION SYSTEM STUDY PROGRAM
Curriculum ID: 1244 Study Program: Information System
Concentration: Accounting Computer

SEMESTER 1			SEMESTER 2			SEMESTER 3			SEMESTER 4		
Code	Course	SKS	Code	Course	SKS	Code	Course	SKS	Code	Course	SKS
UL111	Religion	3	BL103	Indonesian Language	3	SI103	Analysis Information System	3	UM140	Nationality 2	2
BL101	English For IT	3	BL102	English II	3	MT112	Calculus II	2	MJ110	Management Project	2
UL101	Pancasila and Nationality	3	MT111	Calculus I	3	MT131	Statistics Probability	3	SI138	Database System	3
ML101	Algebra Linear	3	SI350	System Information Concept	3	SI330	Analysis Procces Business	2	JR111	Network Computing	3
LL101	Logic and Algorithm	3	SI320	KNowledge 2 Business	3	SI152	Data Communication	2	SI131	Operating System	3
PL101	Niaga Program Package	3	MT121	Statistic Descriptive	3	SI171	Data Structure	3	AK107	Acounting III	3
PL102	Introduction to Information Technology	3	SI161	Accounting I	3	AK106	Accounting II	3	AK161	Examination Accounting	3
			TI171	Organization computer I	2				MJ203	Entrepreneurship	3
	SKS 20			SKS 23			SKS 18			SKS 22	

SEMESTER 5			SEMESTER 6			SEMESTER 7			SEMESTER 8		
Code	Course	SKS	Code	Course	SKS	Code	Course	SKS	Code	Course	SKS
SI340	Management Science	3	HP100	Patent and Trademark Law	3	MJ175	Office Management	3	TI220	Human and Computer Interaction	3
SI111	Design Information System	3	MJ172	IT Research	3	SI221	Testing and Implementation	3	TA101	Essay	3
SI142	Data Warehouse	3	SI121	Management Information System	3	KP100	Job Training Lecture (KKP)	3	MJ200	Professional	3
MT185	Management Marketing	2	EK131	Economic Math	3	SI360	Decision Support System	3	MJ201	Algebra Linear	3
SI139	Database Design	3	MJ183	Software Engineering	3	MT163	Taxing	3			
PR183	Homepage Design	3	AK111	Cost Accounting	3	SI283	Web Programming	3			
AK133	Accounting Based Computer	3	MJ202	Computers and Ssociety	3						
	SKS 20			SKS 19			SKS 15			SKS 12	

Figure 4.3 Accounting Computer Curriculum

Figure 4.3 contains an Information Systems curriculum with a concentration in Computer Accounting.

No	Course Name	Percentage
1.	Cyberpreneurship	75%
2.	Search Engine Optimization	80%
3.	Cryptography & Information Security	90%

Table 4.1 Cyberpreneurship, SEO, and Cryptography courses prospect

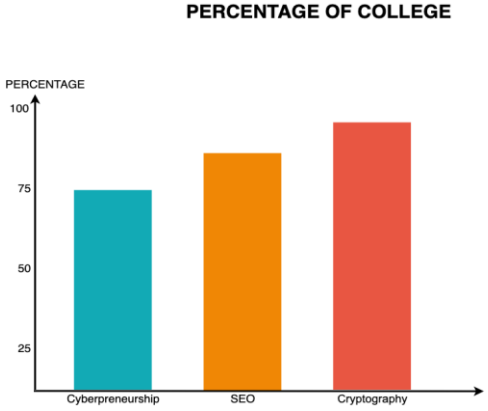

Figure 4.4Cyberpreneurship, SEO, and Cryptography courses prospect

In Figure 4.4 there is a graph from table 4.1 on how Cyberpreneurship, SEO, and Cryptography courses are in demand at various universities also have good prospects and in the world of work as well as surviving the industry.

The information system curriculum studied also refers to the curriculum in general University. Then this research resulted in specialization of courses to be processed and developed with the application of Figure 3.1 regarding the OBE Guide. This course has good prospects in the world of work and survives in this evolving industry. Among 3 (three) courses that have good prospects in the industry now:

1. Cyberpreneurship. Cyberpreneur is the majority of business people who use social media as a platform to run their online business specifically for marketing purposes [34]. Various ways to start marketing methods, technology utilization, and the combination of the two results in the terms SEO (Search Engine Optimization), Affiliate and Adsense. The more advanced technology in the field of computers makes information systems have an important role in all sectors of management of a company, which in this case Cyberpreneurship becomes a subject of digital marketing that is interesting to study [35].
2. Search Engine Optimizer (SEO). One of the benefits of SEO for business subjects that can be sensed is that this course is a good marketing strategymanagement [36]. When implemented, SEO will increase the rank of a web or blog, which when doing business digitally this is a very important thing to learn [37]. By using SEO, the user can get relevant results in a short time and which is very useful and is the most important characteristic of the semantic search system [38].
3. Cryptography & Information Security. Cryptography (cryptography) is the science and art of keeping messages safe [39]. A current example of a document validation process that cannot be carried out face-to-face because of the Covid-19 pandemic. Therefore, we need a technology regarding smart digital signatures that guarantees security without having to meet in person [40].Cryptography is the study of mathematical techniques related to aspects of information security, such as data confidentiality, data integrity, and data authentication [41]. The application of learning methods with the concept of gamification that relies on blockchain technology which also uses cryptography is very suitable for use in learning in tertiary institutions [42]. But not all aspects of information security can be solved by cryptography. With the development of the current era, cryptography courses are very capable in the world. Coupled with the development of Blockchain Technology which also includes Cryptography and Information Security.

In this study the authors used "Simple Random Sampling" to determine the survey implementation of research trust, the authors use the Slovin formula as follows:

$$\boldsymbol{n} = \frac{\boldsymbol{N}}{(\boldsymbol{1} + \boldsymbol{N}.\boldsymbol{e2}\ )}$$

$$n = \frac{1721}{(1\ +\ (1721)(0{,}1)2)}$$

$$n = \frac{1721}{(1 + 17{,}21)}$$

$$n = \frac{1721}{18{,}21}$$

$$n = \ 94{,}5\%$$

(rounded up to 95 samples)

The sample results if you follow the Slovin formula then the number of students (N = 1721 samples) will produce a sample of 95 students who will be easier to memorize with this method.
After obtaining the survey results using the Slovin formula, it will proceed with the reliability test with Cronbach Alpha as follows:

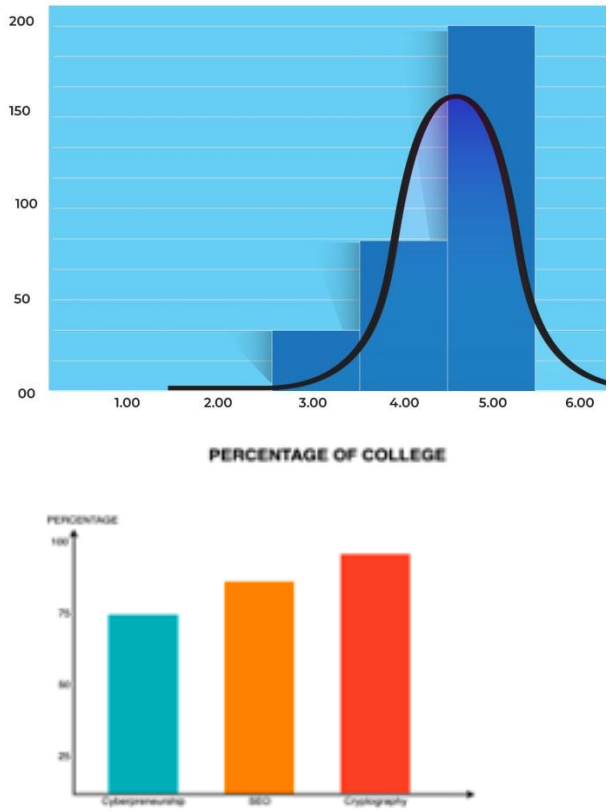

Figure 4.4 Graph Histogram

From the picture above the graph histogram of Q9 has a mean of 4.58, with a deviation of 0.63 out of 250 respondents, it can be illustrated by the data distribution of students memorizing cases. The case process can be explained in the following table:

	N	%
Case Valid Exception Total	250 0 250	100.0 0 100.0

Table 4.2 Data Case

Cronbach's Alpha	N of Item
0.96	25

Table 4.3 Reability Statistic

Proven to provide excellent service to students in terms of Information Systems Information courses so as to increase student satisfaction with the results of the calculation of 250 respondents. At the Reliability X-test output it is known that Cronbach's Alpha is 0.963> 0.6, then the research instrument is declared Reliable.

CONCLUSION

This research is part of a larger study and seeks to examine gaps in the curriculum so as to offer recommendations to universities seeking to improve their Information Systems curriculum. Based on the results of research and discussion that has been done, it can be concluded that: First, the Academic Information System curriculum will be developed by adding a number of new subjects and based on the development and testing as shown in Figure 2.1 and also with a mechanism namely, Analysis of needs; Design; Implementation; and testing. Second, this system implements several new subjects that are tested to be added, namely Cyberpreneurship, Search Engine Optimizer (SEO), Cryptography & Information Security.

The information system curriculum using the Outcome Based Education (OBE) method will be applied to adjust to the needs of the University and current industry developments. With the existing strategy, OBE will make students become learning oriented towards results and in the form of achievements. Thank you to Raharja University for contributing to the collection of research data. The author also thanks reviewers for his comments and comments.

Ontology currently does not stop the need for further research on the Information System Curriculum. Instead, the next important step is to understand and formalize the interactions between students' needs in achieving predetermined results and solving existing problems. Implementation of the curriculum that has been made can help explore all things and develop this research.

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REFERENCES

1. L. M. C. de León, A. H. Mendoza, G. C. C. Suárez, and F. O. Villagomez, "Critical success factors for implementing IT governance in the public universities of Mexico," in *2018 13th Iberian Conference on Information Systems and Technologies (CISTI)*, 2018, pp. 1–4.

2. U. Rahardja, "Artificial informatics," in *2009 4th IEEE Conference on Industrial Electronics and Applications*, 2009, pp. 3064–3067.
3. U. Rahardja, T. Hariguna, and W. M. Baihaqi, "Opinion Mining on E-Commerce Data Using Sentiment Analysis and K-Medoid Clustering," in *2019 Twelfth International Conference on Ubi-Media Computing (Ubi-Media)*, 2019, pp. 168–170.
4. U. Rahardja, Q. Aini, Y. I. Graha, and M. R. Tangkaw, "Gamification Framework Design of Management Education and Development in Industrial Revolution 4.0," in *Journal of Physics: Conference Series*, 2019, vol. 1364, no. 1, p. 12035.
5. Q. Sudaryono, Lutfiani, N., Suseno, &Aini, "Empirical Study of Research Performance Leading to Education 4.0 using the iLearning Method," *International Journal of Advanced Trends in Computer Science and Engineering*, vol. 8, no. (1.5), pp. 264–268, 2019.
6. C. M. M. Isa, H. M. Saman, W. Tahir, J. Jani, and M. Mukri, "Understanding of outcome-based education (OBE) implementation by civil engineering students in Malaysia," in *2017 IEEE 9th International Conference on Engineering Education (ICEED)*, 2017, pp. 96–100.
7. S. Bansal, A. Bansal, and O. Dalrymple, "Outcome-based Education model for computer science Education," *Journal of Engineering Education Transformations*, vol. 28, no. 2, pp. 113–121, 2015.
8. Z. Arifin and L. E. Rahmawati, "SNPT-and KKNI-Based Curriculum Organization," 2016.
9. N. M. Suciani, M. S. Silitonga, and M. Madrikan, "The Evaluation of Internal Quality Assurance System Implementation Program at Bali School Model In 2018," *JPI (Jurnal Pendidikan Indonesia)*, vol. 8, no. 1, pp. 105–112, 2019.
10. U. R. Sudaryono, "Decision Support System for Ranking of Students in Learning Management System (LMS) Activities using Analytical Hierarchy Process (AHP) Method," in *Journal of Physics: Conference Series*, 2020, vol. 1477, p. 22022.
11. B. K. Khalaf, "Traditional and Inquiry-Based Learning Pedagogy: A Systematic Critical Review.," *International Journal of Instruction*, vol. 11, no. 4, pp. 545–564, 2018.
12. N. T. T. Thai, B. de Wever, and M. Valcke, "The impact of a flipped classroom design on learning performance in higher education: Looking for the best 'blend' of lectures and guiding questions with feedback," *Computers & Education*, vol. 107, pp. 113–126, 2017.
13. V. T. Tsyrenov, K. G. Erdyneeva, T. T. Tudupova, P. G. Boronoyev, and N. N. Popova, "Readiness of educational activity subjects for results-oriented cooperation in the inclusive educational practice of higher school," *Journal of Social Studies Education Research*, vol. 8, no. 3, pp. 93–113, 2017.
14. U. Rahardja, A. N. Hidayanto, T. Hariguna, and Q. Aini, "Design Framework on Tertiary Education System in Indonesia Using Blockchain Technology," in *2019 7th International Conference on Cyber and IT Service Management (CITSM)*, 2019, vol. 7, pp. 1–4.
15. R. Parkavi and P. Karthikeyan, "ICT and ALS for Information Technology Programme Courses to Implement OBE: A Survey," in *2016 IEEE 4th International Conference on MOOCs, Innovation and Technology in Education (MITE)*, 2016, pp. 346–350.
16. J. M. Laguador and C. I. Dotong, "Knowledge versus practice on the outcomes-based education implementation of the engineering faculty members in LPU," *International Journal of Academic Research in Progressive Education and Development*, vol. 3, no. 1, pp. 63–74, 2014.

17. S. V. Raju, M. B. Raju, G. Abbaiah, and M. Gudavalli, "Role of ICT in outcome based education," in *2016 IEEE 6th International Conference on Advanced Computing (IACC)*, 2016, pp. 815–819.
18. L. Tian, K. Wang, J. Liu, and J. Shi, "Direct Sequence Spread Spectrum UWB Channel Data Estimation Method Based on OBE," in *2019 IEEE 9th International Conference on Electronics Information and Emergency Communication (ICEIEC)*, 2019, pp. 154–157.
19. J. Zhao, H. Gao, and P. Li, "The Application and Research of the Case-Based Evoked Hybrid Teaching Model Based on the OBE in Application-Oriented Universities," in *2019 IEEE International Conference on Computer Science and Educational Informatization (CSEI)*, 2019, pp. 282–285.
20. J. I. A. Yue, W. E. N. Yan-dong, and W. Xing-hui, "Research on the Formulation Method of Higher Vocational Professional Training Program under the OBE-CDIO Concept," in *2019 14th International Conference on Computer Science & Education (ICCSE)*, 2019, pp. 868–871.
21. H. Jin, "A Case Study of OBE-CDIO Implementation in Network Planning and Design Course," in *2019 14th International Conference on Computer Science & Education (ICCSE)*, 2019, pp. 331–334.
22. J. Yue, "On OBE-CDIO into Inquiry Teaching Reform," in *2018 13th International Conference on Computer Science & Education (ICCSE)*, 2018, pp. 1–5.
23. L. Li, N. Wang, and S. Tang, "OBE-Based Reform for Software Project Management Curriculum," in *2019 14th International Conference on Computer Science & Education (ICCSE)*, 2019, pp. 1075–1079.
24. J. Chen, H. Lu, H. Zhou, and Y. Zhou, "Exploration on Curriculum Teaching Based on OBE and AI," in *2019 10th International Conference on Information Technology in Medicine and Education (ITME)*, 2019, pp. 385–389.
25. T. Mubeen, S. K. Hussain, and F. Aqeel, "TALEM (The Advanced Learning and Education Management) System With OBE (Outcome-based Education)," in *2019 International Conference on Information Science and Communication Technology (ICISCT)*, 2019, pp. 1–5.
26. N. I. Basir, M. Z. A. Bakar, and A. H. Kamaruddin, "Issues in Harmonization of iCGPA with Existing OBE's PO Attainment Methodology for Engineering Degree Programme," in *2017 7th World Engineering Education Forum (WEEF)*, 2017, pp. 597–601.
27. H. Zeynal, Z. Zakaria, M. Anisseh, and S. Mansoorzadeh, "Strategic implementation of outcome-based education system in Buein-Zahra Technical University of Iran," in *2017 IEEE 9th International Conference on Engineering Education (ICEED)*, 2017, pp. 122–127.
28. U. P. Kulkarni, S. B. Kulkarni, K. C. Shindhe, and A. N. Joshi, "A Case Study on an Unrealized Truth of an Outcome Based Education and Corrective Strategies," in *2016 IEEE 4th International Conference on MOOCs, Innovation and Technology in Education (MITE)*, 2016, pp. 285–289.
29. K. Sudheer, V. V. N. Sujit, N. V. G. Prasad, and K. Ravichand, "A Novel Method of Learning Outcome Assessment in Outcome Based Education," in *2016 IEEE 4th International Conference on MOOCs, Innovation and Technology in Education (MITE)*, 2016, pp. 328–331.
30. Z. Mohamed-Kassim and N. Kamaruddin, "Towards an Efficient iCGPA System Using iOBE," in *2017 7th World Engineering Education Forum (WEEF)*, 2017, pp. 103–109.
31. S. Watini, Q. Aini, M. Hardini, and U. Rahardja, "Improving Citizen's Awareness in Conserving Diversity of Malay Traditional Dances in Malaysia through the Art Appreciation Performed by

Students of Early Childhood Education Study Program," *International Journal of Psychosocial Rehabilitation*, vol. 24, no. 8, pp. 2730–2737, 2020, doi: 10.37200/IJPR/V24I8/PR280292.

32. A. Tiwari, A. Singh, S. Shukla, S. Mishra, E. Goyal, and B. Kumar, "Outcome-Based Education (OBE) Academic Planning-An Insight into All Round Development of an Engineer," in *2018 5th IEEE Uttar Pradesh Section International Conference on Electrical, Electronics and Computer Engineering (UPCON)*, 2018, pp. 1–5.
33. Q. Aini, B. S. Riza, N. P. L. Santoso, A. Faturahman, and U. Rahardja, "Digitalization of Smart Student Assessment Quality in Era 4.0," *International Journal*, vol. 9, no. 1.2, 2020.
34. N. Z. Khidzir, W. S. Diyana, W. A. Ghani, T. T. Guan, and M. Ismail, "Task-technology fit for textile cyberpreneur's intention to adopt cloud-based M-retail application," in *2017 4th International Conference on Electrical Engineering, Computer Science and Informatics (EECSI)*, 2017, pp. 1–6.
35. T. Hariguna, U. Rahardja, and Q. Aini, "Effect of Social Media Activities to Determinants Public Participate Intention of E-Government," *Procedia Computer Science*, vol. 161, pp. 233–241, 2019.
36. V. B. Vukšić, D. S. Vugec, and A. Lovrić, "Social business process management: Croatian IT company case study," *Bus. Syst. Res. J.*, vol. 8, no. 1, pp. 60–70, 2017.
37. V. M. Patil and A. V Patil, "SEO: On-Page+ Off-Page Analysis," in *2018 International Conference on Information, Communication, Engineering and Technology (ICICET)*, 2018, pp. 1–3.
38. A. Malve and P. M. Chawan, "A comparative study of keyword and semantic based search engine," *Int. J. Innov. Res. Sci. Eng. Technol.*, vol. 4, no. 11, pp. 11156–11161, 2015.
39. S. K. Routray, M. K. Jha, L. Sharma, R. Nyamangoudar, A. Javali, and S. Sarkar, "Quantum cryptography for iot: Aperspective," in *2017 International Conference on IoT and Application (ICIOT)*, 2017, pp. 1–4.
40. U. Rahardja, S. Sudaryono, N. P. L. Santoso, A. Faturahman, and Q. Aini, "Covid-19: Digital Signature Impact on Higher Education Motivation Performance," *Int. J. Artif. Intell. Res.*, vol. 4, no. 1, May 2020, doi: 10.29099/ijair.v4i1.171.
41. S. Kumari, "A research paper on cryptography encryption and compression techniques," *Int. J. Eng. Comput. Sci.*, vol. 6, no. 4, 2017.
42. Q. Aini, U. Rahardja, and A. Khoirunisa, "Blockchain Technology into Gamification on Education," *IJCCS (Indonesian J. Comput. Cybern. Syst.*, vol. 14, no. 2, pp. 1–10, 2020, doi: 10.22146/ijccs.53221.