Application of expert system for education

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Abstract. Expert systems are artificial intelligence (AI) that attempt to create data, and find data to solve problems. In the process this system will help the student on the basis of expertise. It allows the user to use the computer system as well as use the computer in a specific context. The world's education use expert systems to help the learning process.

1. Introduction

One way to encourage the implementation of quality education is by utilizing ICT media in the process of education. Its development in the world of ICT education is not only as a medium of information and communication technology, but can also be used as a reference system that acts like a competent expert in the field because of the high level of accuracy and is known by the term expert system.

Expert systems are computer software systems that use science, facts, and thinking techniques in making decisions to solve problems that normally can only be solved by experts in the field [1]. The development of expert systems includes the activities and support needed to acquire knowledge and to make conclusions and explanations. The main role in the development of expert systems is the expert knowledge and domain experts who act as designers and builders. Once the system is completed, it is then used for consultation by non-expert users [2].

In the expert system, there are several main components, namely user interface, expert system database, knowledge acquisition facility, and inference mechanism. Inference is the process of generating information from known or assumed facts. Inference is a logical conclusion or an implication based on available information. In the expert system the inference process is performed in a module called Inference Engine [3].

Implementation of expert systems are widely applied in various fields, one of which is the field of education. The application of expert systems in education is used for the development of learners, such as: recognizing student characteristics [5], student performance analysis [6], and prediction of student performance [19]. So is the evaluation system, such as: basic evaluation of student competence [14], character-based education evaluation [9], and evaluation of academic programs [16].

While in the field of vocational education expert system is also applied to: professional profile counseling services [20] [21]. There are many more application of expert systems in education, where the main purpose is to support the achievement of educational goals implemented.

2. Method

The study applied in this paper is aimed to reveal the impact of the application of expert systems in education. Therefore, literacy review (literature study) is done by comparing the various views and research results related to the application of expert systems in education. The literature study on the use

of expert systems in education is drawn from published papers in the 2011 to 2017 range. The electronic databases sought in this literature review include: IJFRCSCE (International Journal on Future Revolution in Computer Science & Communication Engineering), IEEE (Institute of Electrical and Electronics Engineers), John Wiley & Sons Ltd, MDPI (Multidisciplinary Digital Publishing Institute), IJARAI (International Journal of Advanced Research in Artificial Intelligence), Taylor & Francis Group, Agora Psycho-Pragmatica. The keyword search used is "expert system, education".

3. Result and Discussion

Expert systems are software packages or computer program packages intended to provide advice and aids in solving problems in specific areas of specialization such as science, engineering, mathematics, medicine, education and so on. The expert system is a subset of Artificial Intelligence that seeks to adopt human knowledge into computers, combining knowledge and tracing data to solve problems that normally require human skills [4]. In the field of education the application of expert systems not only help students in the learning process but also help teachers and also policy makers in supporting the achievement of educational goals implemented.

The literature review in this paper shows that the use of expert systems in education varies greatly, depending on the interest and capacity of the researcher's knowledge in methodology and problem domain. Broadly speaking the application of expert systems in education can be done for domains: input, process, output and outcome. The application of expert system (ES) in education as literature review is used in the application of: student characteristics [5], student performance analysis [6], evaluation of e-learning [7], technical education requirements [8], character- 9], digital libraries [10], remedial systems [11], learning enhancements [12], lesson plans [13], basic evaluation of student competence [14], academic advice [15], evaluation of academic programs [16], criteria master level [17], the efficiency of teaching and learning [18], predictions of student performance [19] see table 1.

Table 1. Application Of Expert System In Education

Model Application	Author Name	Country	Year
Student Characteristics	T. Van Hecke	Belgia	2011
Student Performance Analysis	P Kaur, S K Singh, P Agrawal and L Jain	India	2014
E-Learning Evaluation	K Salmi, H Magrez and A Ziyyat	Morocco	2014
Technical Education Requirements	T Nakamura, U Kai and Y Tachikawa	Japan	2014
Character Based Education Evaluation	D B Sanjaya and D G H Divayana	Indonesia	2015
Digital Library	D G H Divayana, I P Wa Ariawan, I M Sugiarta, and I W Artanayasa	Indonesia	2015
Remedial System	C- C. Lin, K-H. Guot and Y- C. Lin	Taiwan	2016
Quality Improved of Learning	Dr. Ashwini Kumar and Mr. Nitin Kumar	India	2016
Lesson plan	P Deepti Reddy and A Mahajan	India	2016
Basic Evaluation of Student Competency	L E Sánchez, A S Olmo, E Álvarez, M Huerta, S Camacho and E F Medina	Spanyol	2016
Academic Advice	W Mohamed Aly, K A Eskaf and A S Selim	Arab Saudi	2017
Evaluation of Academic Programs	Maria Viorela Muntean	Romania	2017
Master Level Criteria	S M H Mousavi, M S Mosleh, S.Y M Nezhad and M H Dezfoulian	Iran	2017
Efficiency of Teaching and Learning Process	N Nusua Stella and Dr. Madhu B.K	Nigeria	2017
Prediction of Student Performance	M Kuehn, J Estad, J Straub, T Stokke and S Kerlin	U S A	2017

In vocational education as well as expert system literature review is also used in educational and career guidance services for students [20] and professional skills counseling and guidance services [21] see table 2

Table 2. Application expert system in vocational education

Application Model	Author Name	Country	Year
Educational and vocational guidance	El Haji, A Azmani dan M Harzli	Morocco	2014
Professional skills counseling and guidence services	***Article I.*** D Balas Timar dan V Evelina Balas	Romania	2014

4. Conclusion

The implementation of expert systems in education as literature review in this paper shows that the use of expert systems in education is very diverse. From 17 reviewed journals, we get the conclusions that the implementation of expert systems in the field of education indicates that expert systems are very helpful and solves educational problems, whether related to the input domain, process, output and outcome. For further development it is advisable to incorporate educational methodologies with other fields, since expert systems are a multi-science research topic. For future problems and educational challenges, it is expected to offer more opportunities for scientists to develop better expert systems.

References

[1] Marimin, 1992. *Struktur dan Aplikasi Sistem Pakar Manajemen Pembangunan* **1**(1):21-27
[2] Jabbar. H. K and Khan. R. Z, 2015. Survey on Development of Expert System in the Areas of Medical, Education, Automobile and Agriculture', in Computing for Sustainable Global Development (INDIACom), *2015 2nd International Conference on* , vol., no., pp.776-780, 11-13 March 2015.
[3] Martin, J & Oxman, S., 1988, *Building Expert Systems a tutorial, Prentice Hall, New Jerse*
[4] Arhami, Muhammad. 2005. *Konsep Dasar Sistem Pakar*. Penerbit Andi. Yogyakarta.
[5] Van Hecke, Tanja. 2011. Fuzzy Expert System to Characterize Students. *PRIMUS* 21.7: 651-658.
[6] Kaur, Parwinder, et al. 2014. Fuzzy rule based students' performance analysis expert system. *Issues and Challenges in Intelligent Computing Techniques (ICICT), 2014 International Conference on*. IEEE
[7] Salmi, Khalid, Hamid Magrez, and Abdelhak Ziyyat. 2014. A fuzzy expert system in evaluation for E-learning. *Information Science and Technology (CIST), 2014 Third IEEE International Colloquium in*. IEEE
[8] Nakamura, Taichi, Un Kai, and Yuki Tachikawa. 2014. Requirements engineering education using expert system and role-play training. *Teaching, Assessment and Learning (TALE), 2014 International Conference on*. IEEE
[9] Sanjaya, Dewa Bagus, and Dewa Gede Hendra Divayana. 2015. An expert system-based evaluation of civics education as a means of character education based on local culture in the Universities in Buleleng. *International Journal of Advanced Research in Artificial Intelligence* 4.12: 17-21.
[10] Divayana, Dewa Gede Hendra, et al. 2015. Digital library of expert system based at indonesia technology university. *Development* 4.3
[11] Lin, C-C., K-H. Guo, and Y-C. Lin. 2016. A simple and effective remedial learning system with a fuzzy expert system. *Journal of Computer Assisted Learning* 32.6: 647-662.
[12] Kumar, Ashwini, and Mr Nitin Kumar. 2016. Designing an Expert System for learning improvement. *International Journal of Scientific & Engineering Research*, Volume **7**, Issue 5
[13] Reddy, Patil Deepti, and Alka Mahajan. 2016. Expert System for Generating Teaching Plan Based on Measurable Learning Objectives and Assessment. *Advanced Learning Technologies (ICALT), 2016 IEEE 16th International Conference on*. IEEE

[14] Sánchez, Luis Enrique, et al. 2016. Development of an Expert System for the Evaluation of Students' Curricula on the Basis of Competencies. *Future Internet* 8.2: 22.
[15] Aly, Walid Mohamed, Khaled Ahmad Eskaf, and Amir Serry Selim. 2017. Fuzzy mobile expert system for academic advising. *Electrical and Computer Engineering (CCECE), 2017 IEEE 30th Canadian Conference on*. IEEE
[16] Muntean, Maria Viorela. 2017. Intelligent agent based expert system for blended learning evaluation. *Networking in Education and Research (RoEduNet), 2017 16th RoEduNet Conference*. IEEE
[17] Mousavi, Seyed Muhammad Hossein, et al. 2017. A PSO fuzzy-expert system: As an assistant for specifying the acceptance by NOET measures, at PH. D level. *Artificial Intelligence and Signal Processing Conference (AISP), 2017*. IEEE
[18] Stella, Nwigbo Nusua, and B. K. Madhu. 2017. Expert System as Tools for Efficient Teaching and Learning Process in Educational System in Nigeria, First Step. *International Journal on Future Revolution in Computer Science & Communication Engineering* Volume: **3**
[19] Kuehn, Michael, et al. 2016. An Expert System for the Prediction of Student Performance in an Initial Computer Science Course. *Proceedings of the 47th ACM Technical Symposium on Computing Science Education*. ACM
[20] El Haji, Essaid, Abdellah Azmani, and Mohamed El Harzli. 2014. Expert system design for educational and vocational guidance, using a multi-agent system. *Multimedia Computing and Systems (ICMCS), 2014 International Conference on*. IEEE
[21] Timar, Dana Balas, And Valentina Evelina Balas. 2014. Standardized Professional Counseling Techniques Using Interpolative Fuzzy Expert System In Romanian Profesional Vocational Counselling Services Funded By Europeean Union. *Agora Psycho-Pragmatica* 8.1: 169-180.