

# Study of Skill Tree from Game for Educational World: Application of Skill Tree in Instructional Media of Scientific Writing for Teachers.

Fanani Arief Ghozali  
*Electrical Engineering  
 Postgraduate Program  
 Yogyakarta State University  
 Yogyakarta, Indonesia  
 fanani.ghozali@gmail.com*

Rustam Asnawi  
*Electrical Engineering  
 Postgraduate Program  
 Yogyakarta State University  
 Yogyakarta, Indonesia  
 rustam@uny.ac.id*

Iman Hadi Pramudika  
*Gameloft Quality Assurance  
 PT. Gameloft Indonesia  
 Yogyakarta, Indonesia  
 iman.pramudika@gameloft.com*

**Abstract**— Indonesia has rules that require students to study for nine years. These rules are implemented for making a generation of a smart nation that can survive in the modern era. Therefore, the assigned teachers must be professional. Professional teachers are also mentioned in the Law that they should write scientific papers. However, many teachers do not know how to write scientific papers. In writing scientific papers, there are several important points that must be considered. The points can be mapped to the existing part of the skill tree. Then the skill tree that is created can be implemented in a form of digital media or a media for helping teachers to learn about writing scientific papers. The skill tree uses a method of learning scientific work that is supposed to improve teachers' knowledge about scientific work. Therefore, the current paper was created to analyze the effect of skill tree use in the field of education, especially its impact on teachers.

**Keywords**—*educational world, professional teachers, scientific papers, skill tree, scientific works.*

## I. INTRODUCTION

Changes in teaching profession as functional positions based on the Regulation of the Ministry of Administrative Reform and Bureaucratic Reform of the Republic of Indonesia Number 16 of 2009 [1] and the Joint Regulation of the Head of BKN Number 03 / V / PB / 2010 Number 14 Year 2010 [2] have a positive or negative impact. Teachers as functional officers must be professional and they must be competent in their teaching fields. On the other hand, teachers are required to do scientific work as promotions. However, teachers have difficulties to do scientific work because their teaching schedule and administrative workload make it difficult for them to spend sufficient time for scientific work.

The duties of teachers mentioned in the Law Number 14 Year 2005 Article 1 Paragraph 1 [3] and the Regulation of the State Ministry of Administrative Reform and Bureaucratic Reform No. 16 of 2009 [1] require teachers to become professional in educating,

teaching, guiding, directing, training, assessing and evaluating participants in early childhood education, formal education, basic education, and secondary education and they must carry out sustainable professional development activities namely self-development, scientific publications, and/or the development of innovative work. Based on the above Laws and Regulations of the Ministry, it could be concluded that it is mandatory for teachers to develop scientific work.

There are still some problems related to the development of scientific work such as lack of confidence in scientific work by teachers [4]. There is still some cheating problems at school which happen through plagiarism during scientific work conducted by teachers [5]. In addition, teachers do not attend seminars because there is little information about the availability of them [6]. Therefore, developing a learning model becomes necessary for helping teachers to understand it easily. One of the models that can be developed and applied everywhere for learning is a skill tree model which is available both online and offline games.

Skill tree is often referred to a technology tree, or talent tree. A perk tree is a model in the form of graph used to compose the possibility that makes the skillful player and master the character in a game [7]. Also, skill tree can be used as a guide for developing a game and to define the possibilities of developing computer games and mobile devices.

It is possible to use the skill tree in media for improving scientific publications and teachers' innovative work. As it can be used as a guide for developing graphs, teachers can have the required processes when dealing with scientific papers. Therefore, the application of the skill tree model for instructional media to increase scientific publication and innovative work will quickly enable teachers to master scientific work. This paper describes the methods for using skill tree in education through

instructional media to increase scientific publication and innovative work for teachers.

## II. BACKGROUND AND RELATED WORKS

### A. Backgrounds

Profession is not separated from professionalism and professional ethics. Kultgen [8] explains that profession in the strict sense refers to someone skilled in a particular field, for example medical, legal, architectural, and sometimes ministerial fields. Brown [9] explains that professionalization depends on the creation and the maintenance of at least three components: knowledge, practitioners, and customers. So it can be concluded that professionalism is to bring customer satisfaction. If the customer is not satisfied then the professionalism of a person can be doubted.

The profession of teachers and lecturers is a special field of work and has principles set forth in Law Number 14 Year 2005 article 7 [3], namely: (1) Teachers must have talent, interest, calling soul, and idealism in teaching learners; (2) Teachers must have a commitment to improve the quality of education, faith and piety of learners, and noble character; (3) Teachers must meet the academic qualifications and educational background in accordance with the task field; (4) Teachers should be competent in accordance with the field of tasks being taught; (5) Teachers should be responsible for the implementation of professional duties; (6) Teachers have right to get salary determined in accordance with the work performance; (7) Teachers are entitled to opportunities in continuous professional development with lifelong learning; (8) Teachers should be entitled to the guarantee of legal protection in performing professional duties; and (9) Teachers should have professional organizations that have the power and authority to regulate matters related to teachers professional duties.

One of the teachers professional duties is to do scientific work. Regulation of the Ministry of State for Administrative Reform and Bureaucratic Reform Number 16 Year 2009 concerning Teacher Functional Position and Credit Score [1] also states that every teacher of class III / a up to Primary Teachers of class IV / e shall participate in the implementation of sustainable profession development activities, either by scientific publication or by the development of innovative work. But teachers still need to know methods for studying scientific work. Definitely, one of the methods that can be used skill tree model.

### B. Related Work

Millington [10] describes decision tree as a decision-making technique that uses basic algorithm extensions. Algorithm use continues along the tree and make choices at each decision until there is no more decisions to consider. For each leaf in decision tree there is an action attached. When the decision reaches at an action leaf, the action is carried out immediately. Vizureanu [11] describes that decision tree is a

decision supporting tool that uses a tree-like graph or model of decisions and their possible consequences including chance event outcomes, resource costs, and utility. Decision trees are commonly used in operations research, specifically in decision analyses, to help identifying a strategy most likely to reach a goal. Another use of decision trees is a descriptive means for calculating conditional probabilities. Another term of skill tree or decision tree, Bulitko [12] said that decision tree is a behavior tree. A behavior tree is the technology of choice for programming the AI of NPCs in different game genres. In BTs, instead of explicit transitions from one state to another, each node defines procedurally how to traverse its children. BTs are goal structures that represent how a high-level goal can be decomposed into lower level ones until reaching the leaves of the tree, which contain primitive goals that can be achieved by available actions.

Some previous research about a decision tree conducted by Yücel et al. [13], produced a performance evaluation tool that could be used to classify the shortcomings of teachers and students so that it could be used as a guide to correct the deficiencies. In 2015, McCandless et al. [14] found that using a model tree technique for solar power generation can reduce the mean absolute error of the variability prediction between 10% and 55% compared to using climatological average values of the temporal and spatial GHI standard deviation. That means the skill tree model can map out the results of the predictions for proper decision-making. Topîrceanu [15] found that they developed a useful set of skill tree tools for understanding students who are engaged in online learning. Zhou et al. [16] developed a method that used decision trees that improved filter feature-selection method to predict the listing status of Chinese-listed companies. They found that the proposed feature-selection method could improve the prediction performance in comparison with the genetic algorithm based wrapper method. Based on the previous research, it could be concluded that by using skill tree, the ability to predict and analyze shortcomings in learning and other things could be improved. Therefore, this paper focuses on analysis of the use of skill tree in the field of education, especially in learning about the improvement of teachers scientific work.

## III. METHOD

This research paper underwent a literature review. The literature review uses several steps such as synthesis research, namely the stages of problem formulation, the data collection stage, the data evaluation stage, the analysis data interpretation stage, and the public presentation stage [17]. As illustrated in the flow diagram, the results obtained are shown as in Figure 1 below.

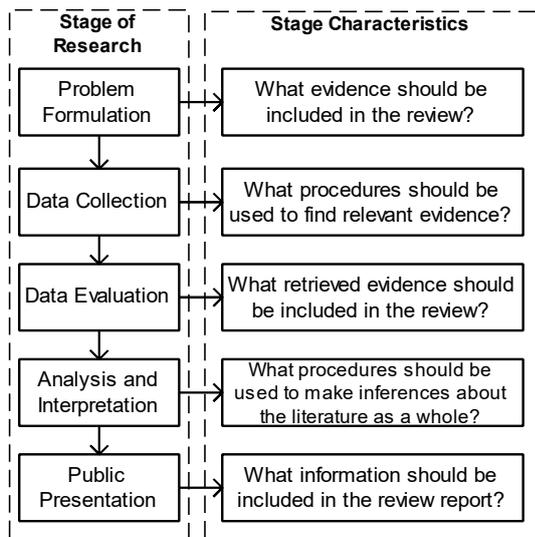


Fig. 1. Literature Review Approach

This approach was used to compare the result of existing project that used decision tree. In this study, the problem formulation is why skill tree is still not widely implemented in instructional media. After the problem was found, the researcher did the data collection by using references both books and research journals related to the application of skill tree. After the data evaluation was done by having conclusions and research results in the journal using document analysis instrument. The obtained data was then analyzed and interpreted by comparing the research result. The result will be drawn in the conclusions which will explain the meaningfulness of the decision tree in education. The projects to be compared are research from:

- A.Seda YÜCEL and Canan KOÇAK with title of Determination of attitudes of student teachers towards the utilization of technology: creating a technology tree.
- T.C. McCandless, S.E. Haupt, and G.S. Young with title of A model tree approach to forecasting solar irradiance variability.
- Alexandru Topîrceanua and Gabriela Grosseck with title Decision tree learning used for the classification of student archetypes in online courses.
- Ligang Zhou, Yain-Whar Si, and Hamido Fujita with title Predicting the listing statuses of Chinese-listed companies using decision trees combined with an improved filter feature selection method.

A primary goal in each of these projects is to find the optimal method to make the output near the smallest error and make the most appropriate decisions. The stage one from this method is the problem formulation. This stage tries to have evidence for problem in each research. In the problem

stated from the first research by A.Seda YÜCEL and Canan KOÇAK, they wanted to know how could the attitudes of the student teachers of chemistry to the utilization of technology be classified and they wanted to make the classification as a guiding tool or performance evaluator [13]. For the problem stated from T.C. McCandless, S.E. Haupt, and G.S. Young research, they wanted to solve the problem of solar energy generation especially from the problem caused by weather conditions using Artificial Intelligence [14]. There are problems because there is no direct interaction between teachers and students. Therefore, it is difficult to detect the problems faced by students. In this regard, they created tools for understanding students with decision trees to suppress student dropout rates [15]. The last research problem is from Ligang Zhou, Yain-Whar Si, and Hamido Fujita that raise the problem of financial prediction for investor. They spelled out that the problem of prediction for investors are indication of delisting risk and indication of other risk [16].

These four researches have similarities. Though, they wanted to make a proper decision method to produce products that match the expectations. All of them use the decision tree as a method for completing the task about decision making. YÜCEL implemented a decision tree by adjusting the technology behavior scale from 50 items previously prepared as a 5 point single-dimensional Likert type, according to the tree classification method [13]. Then McCandless implemented a decision tree by combining additional model options with predictions to reduce errors that exist in the decision tree model [14]. Topîrceanua implemented a decision tree that is the classification tree which will be used for evaluating the students and identifying the students' profiles, strengths, and weaknesses [15]. Zhou used a decision tree as a multi-variable classification tool that will describe the predictions of problems that will occur in the company in the future. The result of the decision tree is combined with artificial neural networks to be able to determine predictions of future errors so that the company can determine the right decision for the company [16].

#### IV. RESULT AND DISCUSSION

##### A. Result

After the comparison of the methods used in each of the existing research, the result could be concluded that the decision tree could be used in every aspect, whether in engineering, financial, business, evaluation or education. Previous studies have shown a positive impact on the application of the decision trees or skill tree. In using decision tree, YÜCEL research obtained the result that they could make performance evaluation tool for classifying the shortcomings of the teachers and the students and a guide for correcting the deficiencies [13]. McCandless found that a skill tree model could reduce the mean absolute error of the variability prediction between 10% and 55%

compared to the use of climatological average values of the temporal and spatial GHI standard deviation when using decision tree [14]. Topirceanua has developed a useful set of tools for understanding students who are engaged in online learning [15]. With that tool, he could evaluate and know the students' condition so he could perform an appropriate treatment with the conditions of the students. Zhou has developed method that used decision trees with an improved filter feature-selection method to predict the listing statuses of Chinese-listed companies [16]. With the method created by Zhou, the errors in the investment company in the future could be predicted for prevention. Judging from all these results using the skill tree or decision tree, the use of such methods can improve results more accurately to make predictions. With the right predictions, the right decision can be made.

### *B. Discussion*

The use of a decision tree that could be applied to many fields still has some deficiencies. First, the decision tree is mostly applied on offline and online game. However, only a few of them are applied in learning or instructional media. Second, the decision tree must be added to other systems in order to have a maximum performance, for example the decision tree is combined with artificial neural networks. Third, the decision tree is still not widely used because there are only few projects that use it and most of people do not know that a decision tree can be used in other project such instructional or learning media. Findings from this study showed that decision tree is usable in many fields whether in engineering, finance, business, evaluation or education. Therefore, the decision tree should be utilized in education both for students and teachers.

Regulations in Indonesia require teachers to be able to create scientific work [2]. But there are still many teachers who face difficulties when dealing with scientific papers. Also, teachers plagiarize when making scientific work [5]. To reduce plagiarism, one could deal with seminars and training of scientific papers for teachers [6]. Therefore, it could be said that the seminar or training of writing scientific papers have not been implemented optimally. Evidence of seminars and training of scientific papers are not optimally visible from many scientific work in writing scientific papers [5]. To overcome this gap, a learning media or self-instructional media needs to be developed. Technology support is urgently needed in the development of media. An alternative solution of the problem is to implement a decision tree in the instructional media. With that method, the teacher can correct his mistake and then determine when to continue writing a scientific paper or prior correct the error. Therefore, the application of a decision tree can be considered for the development of an instructional media for writing scientific papers.

### V. CONCLUSION

In Indonesia, teachers have obligation to do scientific work. The rule provides for the writing of scientific papers used as a condition of promotion. One solution to the problem is to create a learning media that uses Artificial Intelligence in which one is a skill tree. Skill tree or often called the decision tree is a method to determine the decision in the form of a tree chart. In Indonesia, this method is not widely applied in schools nationwide. Therefore, the use of a skill tree in education must be applied to support learners.

### ACKNOWLEDGMENT

The authors are happy to thank both the Electrical Engineering Faculty and the Postgraduate program at Yogyakarta State University. We warmly thank our colleagues from Gameloft Indonesia who provided insight about skill tree in the field of education and their assistance during the research.

### REFERENCES

- [1] Peraturan Menteri Negara Pendayagunaan Aparatur Negara dan Reformasi Birokrasi Nomor 16 Tahun 2009 tentang Jabatan Fungsional Guru dan Angka Kreditnya. Jakarta: 2009
- [2] Permendiknas Nomor 35 Tahun 2010 Tentang Petunjuk Teknis Pelaksanaan Jabatan Fungsional Guru dan Angka Kreditnya. Jakarta: 2010.
- [3] Undang-Undang Republik Indonesia Nomor 14 Tahun 2005 tentang Guru Dan Dosen. Jakarta: 2005
- [4] Rosmha Widiyani. (2016). Minat Guru terhadap Literasi Masih Rendah. Retrieved from : <http://www.harnas.co/2016/04/19/minat-guru-terhadap-literasi-masih-rendah>.
- [5] Kontributor Malang, Andi Hartik. (2017). Mendikbud Akan Hapus Tugas Karya Ilmiah untuk Guru karena Banyak Kecurangan. Retrieved from: <http://regional.kompas.com/read/2017/03/22/18172461/mendikbud.akan.hapus.tugas.karya.ilmiah.untuk.guru.karena.banyak.kecurangan>.
- [6] omdsmy\_novemy\_leo. (2016). Guru di Kupang Pakai Joki untuk Naik Pangkat. Retrieved from : <http://kupang.tribunnews.com/2016/11/27/guru-pakai-joki-untuk-naik-pangkat?page=all>
- [7] Heinimäki. (2015). Technology Trees and Tools: Constructing Development Graphs for Digital Games. Tampere: Tampere University of Technology.
- [8] Kultgen, John. (1988). Ethics and Professionalism. Philadelphia: University Of Pennsylvania Press.
- [9] Brown, Joanne. (1992). The Definition of a Profession. New Jersey: Princeton University Press.
- [10] Millington, Ian. (2006). Artificial Intelligence for Games. San Francisco: Morgan Kaufmann, Elsevier.
- [11] Vizureanu, Petrică. (2012). Advances in Expert Systems. Croatia: InTech.
- [12] Bulitko, Vadim. (2011). Artificial Intelligence for Computer Games. New York: Springer.
- [13] YÜCEL., Et AL. (2009). Determination of attitudes of students teachers towards the utilization of technology: creating a technology tree. Procedia Social and Behavioral Sciences 1:2032–2037
- [14] McCandless., Et AL. (2015). Journal of SOLar Energy 120: 514-524
- [15] Topirceanua, Alexandru., and Grosseck, Gabriela. (2017). Decision tree learning used for the classification of student

archetypes in online course. *Procedia Computer Science* 112: 51–60

- [16] Zhou, Ligang., Et AL. (2017). Predicting the listing statuses of Chinese-listed companies using decision trees combined with an improved filter feature selection method. *Journal of Knowledge-Based System* 000: 1-9.
- [17] Cooper, Harris M. (1998). *A Guide for Literature Reviews Applied Social Research Methods Series*. US: Sage Publications, Inc