Automatic True/False Question Generation using Template-based Framework

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Abstract— **Indonesia is a developing country that is experiencing developments in the field of science and technology. To support this development, it is also necessary to improve Indonesian students' way of thinking. In this paper, we propose a model of generating true/false questions automatically using a template-based framework so that true/false questions can be used as a method of evaluate the way of thinking of Indonesian students. We evaluate the model with qualitative and quantitative testing methods. We use 3 criteria on qualitative testing: fluency, relevance, and answerability. The results of human evaluation for model quality experiments show that the majority (> 50%) assess the model output to be in the range between 'okay' and 'good' for fluency, relevance, and answerability. On the other hand, quantitative evaluation results show that the model we made was able to generate up to 3 questions per input sentence, but the number of questions generated by the methods in the template-based framework model in this paper differs significantly. Specifically, the synonym/antonym substitution method in the model generates an excessive number of questions, while negation modification method generates an insufficient number of questions. We analyzed that there is still ample room for improvement especially in terms of the fluency of the generated questions.**

Keywords—true/false question generation, template-based framework, quality of thinking.

I. INTRODUCTION

Indonesia is a developing country that is experiencing development in many fields, for example in science and technology [1]. In the process of this development, it is also necessary to improve the quality of education. The purpose of improving education quality is to upgrade the way of thinking, logic, reading interpretation, and confidence of Indonesian students. To test the thinking and logic skills of Indonesian students, scholastic questions and multiple-choice questions have been created [2].

The scholastic potential and multiple-choice test aim to measure the cognitive mind of students in completing studies in further education [2]. Even though multiple-choice questions often used to measure students' knowledge about the material taught in class, multiple-choice question has its negative impact which may unintentionally lead to the creation of false knowledge [3]. Among different sort of educational-purposed questions, true/false questions is simple and easy to make, but still able to assess the students' way of thinking [4]. Not only that, if we step up the difficulty of the test by creating multiple true/false questions, it can bring more complexity than multiple-choice questions [5]. To test the student confidence and reading interpretation skills, we can use true/false (T/F) questions approach because the

relationship between correctness of knowledge and the student confidence to believe that the knowledge they possessed to be the truth is important [6]. Understanding which facts can be inferred to be true or false from text is an important part of natural language understanding, but being brave to state that the facts are the truth or false which in many cases this action can go beyond on what is stated in the text [7]. True/false questions can also be a tool to assess whether the student knowledge is affected by misinformation by setting up a question related to the which knowledge the examiner wanted to assess out of the student [6].

Not only that, based on the research of Chad E. Brassil and Brian A. Couch (2019), true/false questions will also unlock greater capacity to characterize student ways of thinking [5]. Repeated true/false questions can also assess *'negative suggestion effect'* of student [8], [9]. Based on study that have been done by Remmers & Remmers (1926), saying that repetitive true/false questions have a chance to give suggestions which students learn incorrect information because of exposure to false items [9]. Thus, bring us back into the confidence factor of the student [8].

This paper will be focusing more on assess reading interpretation and comprehension skill of Indonesian students, by proposing a True/False Question Generation (TF-QG) model from Indonesian passages [4]. The TF-QG model in this paper will be using a traditional template-based method to create a simple manipulated statement from the original passage and the student must mark them as true or false. In the template-based framework, various NLP techniques are used to create heuristic templates to test lexical and syntactic understanding [4]. In this work, we use four methods to manipulate the passage which are coordination modification, negation modification, number modification, and synonym/antonym substitution. It is expected that with this TF-QG model, true/false questions can be used as Indonesian student practice materials, because of its function to direct assess, simplicity, and efficiency to use.

The contribution of this paper is to model a true/false question generation for education question in Indonesian text. We use elementary and secondary school text as the model input. Based on the model we built, we will also test the effectiveness of the model. The expected benefit is to facilitate the automatic TF-QG to be used in Indonesia as its educational assessment system.

II. RELATED WORKS

Question Generation (QG) is a task to generate a question according to a given text that should meet several requirements, such as: valid and fluent [10]. The formal