The development of mathematics student worksheet for school literacy movement

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Abstract. This paper discusses the development research that produces the student worksheet of school literacy movement in junior mathematics learning. The developed worksheet is organized based on the Realistic Mathematics Education approach. This research uses a design research method with the type of development studies and the evaluation flow used is formative study, including self-evaluation, expert review, one-to-one, small group, and field test. However, this paper only would be discussed about the expert review and one-to-one phase. The research subject is the students of grade VII SMP Karawang. Data collected using walkthrough and documentation. Based on the analysis, it concluded that this research has resulted in a valid product in the form of the reading worksheet of school literacy movement in mathematics.

1. Introduction
School literacy movement, at this time, starts to be implemented by schools in Kabupaten Karawang as an effort to increase the learners’ reading interest. School literacy movement is a comprehensive effort to make schools as learning organizations that make citizens literate through public engagement in their life [1]. The purpose of this movement is to cultivate the character of the learner through the culture of the school literacy ecosystem embodied in school literacy movement so that they become lifelong learners [1]. School literacy movement consists of three stages, namely: the stage of habituation, development stage, and learning phase. The activities at each stage take 15 minutes to read by \textit{Permendikbud} No. 23 Years 2015. This reading activity is expected to foster learners’ interest in reading.

School literacy movement is generally still at the habituation stage. At this stage, learners are familiarized to read, so that the learners’ interest in reading will be increased. This activity is done during the first lesson when students were reading fiction books such as novels that they bring from home or books provided in the school library for 15 minutes and then determine the essence and the synopsis of the books they read. The activity is done in the first hour so every lesson using a fiction book will interest the learners without encouraging learners to look for the communication between the books read with the material to be studied. This shows that the development stage has not been implemented. Furthermore, the learning phase has not been implemented. It is because a non-lesson book, that accordance with the mathematical material to be studied, is hard to find by the teachers.
Mathematics is a lesson that is closely related to daily life. Human activity in daily life can not be separated from the utilization and application of concepts that exist in mathematics [2]. The cases those relate to the daily life of learners can be a starting point to learn a matter in mathematics school. The context or experience of students is used as the starting point of the mathematics learning process [3]. The reading text in the school literacy movement at the learning stage can serve as a starting point for learners to learn math materials. Based on the principle of school literacy movement in the learning phase, the reading book is a book about general knowledge, or passion, and can also be associated with specific subjects (not just language) and there are bills related to subjects [4]. Reading is an interactive activity to pick and understand the meaning or message contained in written materials [5]. Reading activities in school literacy movements using the reading texts with contexts favored by learners and related to the subject will develop students learning skills and develop learners' understanding of mathematics learning. One of the goals of the school literacy movement is the stages of learning can develop the ability to understand the text and relate it to personal experience so it will form a lifelong personal learner [4]. One mathematical learning theory that is suitable to be used in teaching mathematics relating to the context or situation is the Indonesian Realistic Mathematics Education. Learning with RME starts from a context that raises the informal reasoning of learners, with an accompanying set of statements used to build relationships between formal, pre-formal, and formal mathematical representations [6]. According to these principles, mathematics learning should give students the opportunity to understand and process the rediscovery of mathematics itself [7]. In this case, the used context should be meaningful and real to the students’ thinking [3]. The futsal game, at the moment, became one of the sports that are very popular among various circles, both parents and children, both women and men, so that it can be used as a context for mathematics learning.

According to the International Council of Sport, sports education is a physical activity that contains the nature of the game and contains struggles with self or others and confrontations with the elements of life [8]. Some topics about the interaction between mathematics and sports are related to statistics such as how to complete relationships between tables league or sports games that are individual or grouped like chess and football [9]. Futsal is a ball game played by two teams, each consisting of five people who aim to make a goal with the ball into the opposing goal by manipulating the ball with the foot [10]. The futsal game includes a collection of players who can play futsal. In a mathematical set of objects that have properties with clear definitions is defined as a set. The set is the basic concept of all branches of mathematics [11]. The description shows the futsal game is a sport that can be used as a context in the learning of mathematics because futsal game attracted many learners and had a relationship with mathematics. Learners who learn to use sports contexts will find that math is more fun because it is different from repetitive math exercises [12]. The study used sports context successfully helps students in learning mathematics, especially in swimming. The swimming context could stimulate students’ informal knowledge about the meaning of fractions which it can be used in the additional learning either the same denominator or different denominator [13].

2. Method
This research uses the method of design research with the type of research development or development studies [14]. This study was conducted in three stages, that is a preliminary or preparatory stage, the prototyping stage, and an assessment stage [15]. In the prototyping stage, the evaluation uses formative evaluation with the phases includes self-evaluation, expert review and one-to-one and small group, as well as field tests. Meanwhile, to analyze the two previous stages, the researchers use the assessment stage [16]. In this article, the discussion of research is the result of expert review phase and one-to-one. Expert review and one-to-one are phases at the prototyping stage. Prototyping phase with grooves formative evaluation includes self-evaluation, expert reviews and one-to-one, small group and field test.

In the self-evaluation stage, the researchers evaluate the text-reading design used in the school literacy movement in mathematics learning activities. The design process uses three characteristics
that are content, constructs and language. The results are analyzed to form the first prototype can be seen in Table 1.

| No. | Characteristics | Examined Aspects |
|-----|-----------------|------------------|
| 1.  | Content         | Text according to RME principles (Realistic Mathematics Education). Text according to futsal game theory. The text corresponds to some mathematics material of grade VII junior high school. Text according to School Literacy Movement concept. |
| 2.  | Construct       | The text constructs of learner’s knowledge. The text contains various mathematical concepts. The text corresponds to the level of thinking of grade VII junior high school. |
| 3.  | Language        | Text in accordance with Indonesian standard language. The flow on the text is not convoluted. Sentences on text are not ambiguous. |

The text is developed based on the stages of the school literacy movement using the futsal game context. At the stage of habituation, the text tells about the history of futsal in the world and in Indonesia along with the achievements of the national team futsal’s son and daughter. At this stage, the text has not been given a question to know the relevance to mathematics because at this stage the purpose is to make learners have an interesting and accustomed to reading. At the development stage, the text tells the rules in futsal game which includes field, ball, sanction, game system, and basic technique and strategy in futsal game. The questions at this stage begin to develop the learner’s thinking to know the interrelation between futsal and mathematical material, such as a coaching strategy that sets up groups for players in a team to implement game patterns according to the player’s ability to relate to the material sets. At the learning stage, the text presents a short story titled *Harumkan Nama Kampus Dengan Modal Kebersamaan*. The text at this stage is arranged based on the set material that is the concept of set, the universal set, the empty set, subsets and the presentation of the set, and the operation on the set. The questions in the text correspond to the material being studied because the questions are based on the purpose of the learning stage. The text is organized on the basis of the set material, so the questions at this stage can help learners understand the material sets.

At the expert review stage, the expert validated the prototype. Expert validation uses analysis in terms of content, constructs, and language. Experts who are referred in this study are mathematics education experts, and futsal game experts. The first prototype’s validation process of the expert review stage is done through three ways face-to-face review, mail/review (mails review), and panel review [16]. Based on results, the product is revised. Along with the expert review, researchers test the students individually (one-to-one). Results from one-to-one are used to revise the product to be created.

3. Results and Discussions
The result of the expert review and one-to-one phases is experts’ validation related to the first pre-designed prototype and it is tested on three students as a one-to-one tester. The first prototype was tested on three students of class VII K, initially: BRS, RR, and ENS. The purpose of the implementation of this trial is to determine the responses and difficulties that will be faced by learners at the time of reading and answering questions on the text. The observed responses and difficulties focus on the legibility and conspicuousness of the text along with the question on the text. The reading text in this study was prepared for the School Literacy Movement consisting of the stages of habituation, development stage, and the learning stage.

At the stage of habituation, it consists of texts on the history of futsal’s world, futsal history in Indonesia, and the achievements of Indonesian futsal national team. At this stage, learners are asked to
read and resolve questions related to the text and in accordance with the objectives at the stage of habituation such as increasing the love of reading outside the lesson, improving the ability to understand reading, improve self-confidence as a good reader, source of reading [4]. Based on the results of the students’ answers, it can be indicated that they understand the text and there is no significant difficulty for them when answering questions from the text. The questions on the text of the readings are about like or dislike to the text by the learners, the words that are difficult for them, and retell the text they have read using their language. Also, they like the text they read because the text provides information which they did not already know.

The development stage consists on text futsal field and ball game, the basic of futsal game technique, futsal game strategy, sanction in futsal game, and futsal game system. At this stage, after the learners read they also answer questions related to the text that has been read and the question which accordance with the purpose of development stage, namely students are able to find the relationship between the books that was read by themselves and the surround environment [4], one of that is the mathematical material they learned in school.

In the text entitled futsal game strategies, learners have an opinion about the mathematical material associated with the text, so they can construct their knowledge of the mathematical material of the text. This text material presented the coach’s strategy in dealing with the rivalry by creating groups of players in his team to play the game pattern. In addition, the material of attacking and defensive game patterns accompanied by images shows the quadrilateral formed of the patterns. Based on the answers of learners, they are able to answer the mathematical material they can learn from the text. Mathematical material that can be learned from the text titled futsal game strategy according to RR, it is the set; whereas according to ENS, it is a quadrilateral; and according to BRS there are rectangles and kites. Figure 1 and 2 are some pictures of the futsal game attack pattern.

![Figure 1. Attack Pattern 2 - 2](image1)

![Figure 2. Attack Pattern 3 - 1](image2)

The reading text in the learning stage of school literacy movement with futsal game context can be a starting point in mathematics learning, so the learners can construct their knowledge to understand a mathematical concept. The use of context is to make a line with the characteristics of Indonesia’s realistic mathematics education which aims to help learners understand a mathematical concept. Thus, the learners play an active role to understand the relevance of the context with the math material being studied, so the learners can understand concepts and solve mathematical problems. The realistic mathematical approach is suitable for mathematics learning because RME has characteristics and principles that students enable to develop optimally, such as the freedom of students to express their opinions, the existence of contextual problems that can relate mathematical concepts to real life, and it can facilitate students in solving problems [17].

Based on the learner’s answer to the text relating to the subset material, it shows that they can mention the player who brought the cones is part of the team in futsal A and the reason they have pointed has already led to the subset material. Also, they can give other examples of the subsets they encounter in the text. They can see the relevance of the document they read with the mathematical material so that the text material could build their understanding into a formal concept of subsets. Through the activities of school literacy movement in the learning stage, it can enrich the knowledge of learners in learning mathematics so the obtained results will be by learning objectives. Literacy
mathematics is introduced explicitly as an intervention to improve the ability of learners in mathematics learning [18]. RME strongly influences mathematical literacy because RME stresses the importance of solving mathematical problems in real-world settings so that it can be used as a fundamental theory for developing literacy-based learning math [19]. Figure 3 is the answer from one of the student.

![Figure 3. Student answer](image)

After the implementation of the test, the researcher provides the students the opportunity to give comments and suggestions about the reading text of the school literacy movement. The students’ comments show that they like the text because it adds to their knowledge of futsal, and they know of a connection between mathematics and futsal. Also, the given advice is to add people’s photos to futsal history text. The majority of students in Indonesia is anxious and dislikes the mathematics learning, so their mathematical achievement is low [20]. The students’ comments indicate an interest in reading the text. From that interest, mathematics learning will be preferred to students. It is because the learning of mathematics begins with the context that is commonly encountered learners. RME is a learning that uses reality as a starting point in the learning process that aims to support students in building and rediscovering mathematics through contextual problems [21-24].

In the expert review the researcher asks the opinion of experts who have experienced in mathematics education, futsal games, and school literacy movement. The responses and suggestions of experts and peers about the designs that have been made are written on the validation sheet as material for revising and declaring the valid text. The literature text of the developed school literacy movement is validated through one to one and expert review. This is in line with triangulation, that are the process of using conflicts of data from different sources, confirming observations from different observers, and confirming information with different data collection methods [25]. Triangulation is a data validation technique by utilizing something else beyond that (the expert and the work of learners) as a benchmark/revision of the assessment instrument. The valid aspect associated with the developed text is based on a strong theoretical rational and internal consistency [26]. The reading text for the school literacy movement on mathematics learning based on the one to one stage and expert review is valid with the revision of complete information with photos and pictures –the presented image must be clear between the player, the ball, and the direction of the ball and the direction of the player and accompanied by a description. Also, sentence writing should be in accordance with Indonesian standard language and the final text for the two parts. Validity test is conducted so that the instrument made to produce information that is appropriate, meaningful, precise, and useful in the withdrawal of conclusions made by researchers [27-28].
4. Conclusion
The result of this research is the Reading Text Materials for School Literacy Movement in Junior High School Mathematics Learning. The first prototype of the developed text material is valid based on the Expert appraisal and one-to-one test. The prototype is matching regarding content, constructs, and language. In total, three text materials for the habituation stage, five text materials for the development stage, and four text materials for the learning stage.

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