Prototype of mathematics club module in a co-curricular activity for elementary students

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Abstract. This article is a part of research on the development program of Mathematics Club as a cocurricular supporting program in a full-day school. The development procedure in this research uses the ADDIE method, but it lacked implementation due to the COVID-19 pandemic. This article specifically elaborates on the prototype of the mathematics club module and its procedure as a co-curricular activity in a full-day school. According to the initial observation, it is concluded that the cocurricular implementation in the full-day school is not optimal. This is because of a lack of school preparation in designing the co-curricular program and its auxiliaries. An alternative offered by researchers to overcome the problem is by designing the Mathematics Club program as well as its module as the teaching module. The mathematics club module displayed the experiment procedures on fraction lesson, to grasp the understanding of the fraction operations concept. The module was also supplied with media that can be used by the students in their experimental activities.

1. Introduction
Nowadays, many schools implement the Act of the Ministry of Education and Culture No. 23 Year 2017 Article 5 about the five school days. Even though it has allured pros and cons, the full-day school system is still implemented with all of its obstacles. The basic challenge was the varying infrastructures, means, and human resources of different schools [1]. However, many elementary schools lately implement the 2013 curriculum (K13) in the full-day system. In the full day regulation, every school is obliged to implement three activities namely intra-curricular, co-curricular, and extracurricular activities [2]. Learning must have integration of intra-curricular, co-curricular, and extracurricular [3]. The intra-curricular activity is executed according to regulation. The regulation in K13 curriculum implemented in face-to-face teaching, referring to core competencies (Kompetisi Inti) and basic competencies (Kompetensi Dasar). Other than the intra-curricular activity, the extracurricular one is not foreign to society in general. The extracurricular activity is an activity to develop the students’ potentials, talents, interests, abilities, cooperation, and independence, which is done under school supervision. Extracurricular activities have enormous benefits on the school performance as well as the overcoming of school failure and abandonment [4]. The extracurricular activity can be basketball, dance, robotics, etc. Besides, the co-curricular activity in an activity to strengthen or deepen the basic competences or an indicator on a certain lesson or field. The co-curricular activity can be presented as an extracurricular but the presentation of co-curricular is referred to as the intra-curricular one.
Experience from co-curricular activities shape an alternative curriculum, one that helps to shade the behavior of the students and is well incorporated into the daily program of the school [5].

According to interviews with teachers from a full-day school, it is concluded that co-curricular activities have been applied. However, the co-curricular activities have been optimum, neither the plan nor the implementation. For instance, in SD Laboratorium UNP Kediri, there have been activities such as “Smart Day” focusing on mathematics and its real-life applications. Nonetheless, the activity has not had clear planning [6]. The co-curricular activity is done situationally by observing the intracurricular lesson at that time. This means the cocurricular is not well structured. Also, co-curricular activity has not had a structured learning source. This is because of the lack of preparation for the co-curricular activity. This finding is similar to Rivilla and Hadjah [7] in their study about the abacus co-curricular program. Their study showed that the abacus co-curricular in SDN Landasan Ulin Barat 1 Banjarbaru has not got good control over its implementation. Another research was also conducted in college program and have conclusion result that co-curricular activity can improve student ability [8-10].

Currently, mathematics lesson for higher class on intra-curricular activity is presented separately. The Curriculum 2013 Revision 2018 has been aligned for mathematics lessons supported with the teacher and student book “Senang Belajar Matematika” as an intra-curricular support [11]. The mathematics lesson is presented for $6 \times 35$ minutes in a week. Even though mathematics has a higher proportion than other subjects, the lesson is still considered frightening for the students. For that reason, a co-curricular activity needs to be designed to support the subject (called mathematics club), which is presented less stiffly as an extracurricular activity which can stimulate the students to experiment without any pressure like the formal lesson (intra-curricular activity).

In order to plan and implement the mathematics club cocurricular, a module is necessary for the students to conduct experiments. The module is selected as a learning material in this cocurricular for it can facilitate the students to study independently. Many studies have shown the advantages of modules compared to other learning sources, as shown by Ilahiya [11], Primasatya [12], and Schack [13]. In addition to the module, the mathematics club cocurricular is also supplemented with other media used in experimental activities. The use of media in this module also has advantages compared to the others. The use of learning media can also optimize the process of knowledge construction for the students when conducting experiments [4]. According to observations and literature studies, this article studies the prototype of the mathematics club module which is used in co-curricular activity in a full-day school.

2. Research Method
The method which is used in this research is a development study with the ADDIE method (Analysis, Design, Development, Implementation, and Evaluation). However, this article specifically only studies the step of product design on the prototype of the mathematics club module being developed. On the product design, the mathematics club module is designed on three characteristics, namely, content, construct, and language. The data collection method is documentation with a descriptive qualitative analysis technique. Other from describing the parts of the module, this article also describes the results of the validity that was carried out to three validators. Each of these validators assesses the content of the media, material, and language. Validity was carried out using a material of validation questionnaire, a media validation questionnaire, and a language validation questionnaire. The data obtained from this validation process is scores of validation questioner and suggestions or comments to related the module. This research is doing on covid-19 pandemic, so the process of implementation could not be carried out. Implementation proses will do as soon as after this pandemic over and face to face learning active.

3. Result and Discussion
This article studies the design and prototype of the mathematics club module, which is applied as a co-curricular activity in a full-day school. The module contains experimental activities, summarizing lessons, problem examples, and exercises referring to the lesson of fractions in the 4th and 5th grades. The selection of lessons for this module was based on a literature study and students’ questionnaire because the implementation of co-curricular activities is to support the intra-curricular ones. Based on analysis
of situation noted that student prefers that co-curricular activity design like experimental activity in a lot of game as extracurricular [14].

According to the questionnaires, it was concluded that 89% of the students had difficulties understanding fractions especially in sorting and mathematical operations. In line with the purpose of the co-curricular activity, it has to support the lesson considered the hardest by the students and needs further understanding [7]. Besides, there are many misconceptions about fractions. The problem concerning fractions is the fault in teaching the concept without considering the contextual genesis step, the conceptual complexity concerning fraction modeling, the arithmetic of fractions dissimilar with that of the whole number, and unrealistic fraction lesson [15]. For those reasons, the mathematics club module is designed to involve fractions in its experimental activities. The content of the module is a whole lesson covered in mathematics for 4th and 5th grade, including:

- Definition of fractions,
- Types of fractions (simple fractions, mixed fractions, decimal numbers, percentage),
- Similar fractions,
- Sorting fractions,
- Arithmetic operation on fractions (addition, subtraction, multiplication, division).

The lesson is divided into 7 experimental activities, each containing summary, example, and exercises. An example of the experimental activity support is shown in Figure 1.

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Figure 1 shows the experimental activity support of supervised findings to grasp the concept and definition of fractions. The activity is also supported by the use of a concrete medium. A media that can be used is shown in Figure 2. This use of medium can also construct the students’ knowledge of fractions [10]. In the mathematics club module, every experiment is also accompanied by concrete media to help the students experiment.
After finishing the experiment, the students are directed to summarize the concept they have learned. As soon as they make their summary, the students are expected to confirm their work with the supplied conclusion in the module as seen in Figure 3.

Other than experimental activities, the module is also supplied with lesson summary, examples, and exercises. The exercises are presented in this module not only to deepen their understanding but also to develop their problem-solving skill. An example of exercises is seen in Figure 4.

The exercises used in this module are of HOTS type exercise. The purpose of HOTS type implementation is to develop the students’ 4C skills (critical thinking, creative thinking, communication, and collaboration). The 4C skills are essential for the students in facing the industrial revolution 4.0 [11] [16].

After prototype module has been made, the validity of the prototype module is tested by three validators. Each validators assessment the characteristic of media, content material, and the language used. Score of validation is presented in table 1.
Table 1. Validity of Modul Mathematics Club

| Indicator                  | Score | Percentage | Conclusion |
|----------------------------|-------|------------|------------|
| **Validity of Media**      |       |            |            |
| Display of media           | 44    | 80 %       | Valid      |
| Easy of use                | 47    | 94 %       |            |
| **TOTAL**                  |       | 87 %       |            |
| **Validity of content**    |       |            |            |
| Presentation material      | 49    | 89 %       |            |
| Completeness of material   | 33    | 83 %       | Valid      |
| Profound of material       | 34    | 85 %       |            |
| **TOTAL**                  |       | 86 %       |            |
| **Validity of language**   |       |            |            |
| Cognitive level of student | 46    | 92 %       | Valid      |
| Communicative              | 42    | 84 %       |            |
| **TOTAL**                  |       | 88 %       |            |

Based on table 1, all validator provide that module Mathematics Club is valid and can use by students. In addition, the validator also provide suggestions as shown in table 2.

Table 2. Suggestion of Validator

| Validator                      | Suggestion                                                                 |
|--------------------------------|-----------------------------------------------------------------------------|
| Validator of Media             | Proportion of the answer column is not sufficient for the students answer needs. |
| Validator of Content Material  | The material in module needs to be deepened with a lot of example.         |
| Validator of Language          | Some term that use in module is not appropriate for the cognitive level of student in elementary school, such as “noktak”, you can use “titik” to replace. |

The result of validation provide show that the module Mathematics Club is valid. Based of that module Mathematics Club no need revision. However, the suggestions given by validator are still consideration in making improvements.

4. Conclusion
In line with the research and development, this step is the design step which results in the mathematics club module as a product. The mathematics club module will be used in a co-curricular activity of full-day schools, specifically for the 4th grade. The next step is the validation of this module to evaluate its validity according to its content, construct, and language. The result of validation showed that score 87% for validity of content, 86% for validity of construct, and 88% for validity of language. So, prototype of module Mathematics Club is valid and it can be tested to elementary student.

5. References
[1] Miftah M 2018 No 23 Tahun 2017 *J. Perspekt.* 1
[2] Mendikbud 2017 Permendikbud No 23 Tahun 2017 Tentang Hari Sekolah *Ber. Negara Republik Indones. Tahun 2017 Nomor 829*
[3] Alimah S, Anggraito Y U, Prasetyo A P B and Saptono S 2018 *J. Phys. Conf. Ser.* 983 0–6
[4] Barabas A 2020 *J. Pedagog.* 1 173
[5] Rathore K, Chaudhry A Q and Azad M 2018 *Bull. Educ. Res.* 40 183
[6] Muijwati E S, Soenarko B, Permana E P, Sahari S, Primasatya N, Hunairi A A and Aka K A 2020 3 165
[7] Rivilla S R 2014 *Al Adzka* 4
[8] Mancha S A and Ahmad A 2016 *Int. Conf. Educ. Reg. Dev.* 1 774
[9] Knight D B and Novoselich B J 2017 *J. Eng. Educ.* 106 44
[10] A. Samad N and Idris M 2017 *Educ. Technol.* 1 47747
[11] Ilahiyah N, Yandari I A V and Pamungkas A S 2019 *Terampil J. Pendidik. dan Pembelajaran Dasar.* 6 49
[12] Primasatya N and Jatmiko J 2018 JIPMat. 3 115
[13] Schack E O, Fisher M H, Thomas J N, Eisenhardt S, Tassell J and Yoder M 2013 J. Math. Teach. Educ. 16 379
[14] Primasatya N and Imron I F 2020 J. Math Educ. Nusant. 6 215
[15] Chen X and Li Y 2010 Int. J. Sci. Math. Educ. 8 711
[16] Widiawati L, Joyoatmojo S and Sudiyanto 2018 Int. J. Multicult. Multireligious Underst. 5 96