

karawitan learning in elementary school and the difficulties of school to provide the instruments, a research on designing *gamelan* trigger has been realized. It aimed to develop a prototype of *gamelan* trigger enabling student to play *gamelan* in its real form with smaller size. It was carried out by binding two different fields: science and arts into an integrated matter to produce the trigger. The research was supported by the “*Hibah Bersaing*” grant funded by the *Kemenristek-Dikti* 2015.

METHOD

Ten stages of designing *gamelan* trigger was performed under a research and development (R & D) method adopted from Borg and Gall (1989: 784). These stages were research and information collecting, planning, develop preliminary form product, preliminary field testing, main product revision, main field testing, operational product revision, operational field testing, final revision products and dissemination and implementation. The research was done in both Sendratasik recording studio laboratorium-Unnes and Physics laboratory Unnes.

Several facilities were provided to support the research, such as music recording studio, workshop laboratory, a set of recording instruments, a set of sampler computer, and a set of slendro javanese gamelan.

The process of designing the trigger was started by doing *gamelan* sound sampling. It was then followed by audio data editing to improve the *gamelan* sound quality in terms of noise reduction and adjusting sampling rate and bit. After editing, the data gathered was kept in a sound module instrument as the sound bank. The next processes were setting the software and hardware to produce sound module, saving the *gamelan* sound into a memory card, mapping *gamelan* tones, designing sound

modul and vibration sensor circuit, and designing *gamelan* model.

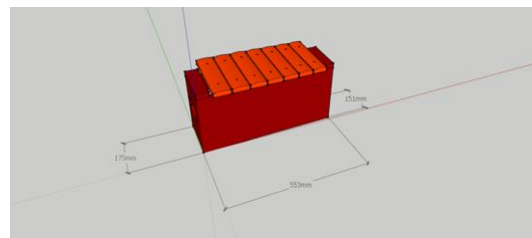
RESULT AND DISCUSSION

Having the overall processes mentioned in the above section, there are two main forms of result can be obtained, as shown in **Fig. 1**.

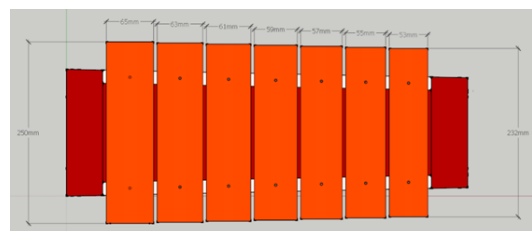
Figure 1: Results of processes carried out in designing the *gamelan* trigger: (a) Sound module and vibration sensor circuit, (b) The *saron* model (front look) (c) The *saron* model (top view) (d) the *saron* model (back view)



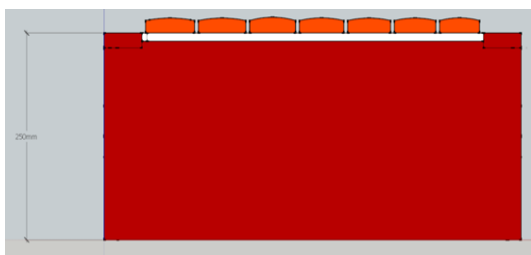
(a)



(b)



(c)



(d)

Fig. 1 (a) shows the product of sound module and vibration sensor. In this study, this product will be used to save and deliver the sound of *gamelan* kept in memory card. It will be mounted on the *rancak* of the *gamelan*. This device will work as a trigger when the *wilah* of the *gamelan* is tapped by the player. Vibration resulted from the tapped *wilah* will be sent to the sensor and received by the microcontroller which then calls appropriate sound recorded in the memory card. This sound will then be sent out in a form real *gamelan* sound through the audio port. In addition to have environment of playing the real *gamelan*, the small size model of this Javanese instruments will then be used. Each instrument can be played by the player (i.e student) through a specific way. For instrument with type of *balungan* (i.e. the *saron*, the *demung*, the *peking*, the *slenthem*, and the *gender*), as shown in **Fig. 1** (b), (c) and (d), the player must tap the *wilah* in order to get the sound, while the instruments having type of *pencon* (i.e. the *bonang*, the *kenong*, the *kempul* and the *gong*), the student must tap it at its *pencu* (part of the instrument having hemispherical form).

These all results represent the use of science and arts in their process of production. In order to make the sound module and vibration sensor, science knowledge of such electronics circuit and other related concepts need to be have and applied in the work. Understanding of every electronics component, both its name or terms, such as microcontroller,

electric piezo and other general physics terms, and how it works is very important. Additionally, skill of fabricating the device (e.g. connecting every element of an electronics circuit) should also be mastered. It needs more practices to be skilled in building a relatively complex electronic circuit. The use of science is not only applied in making the sound module and vibration sensor, but also in the process of developing the *gamelan* model. Since the real size of this instrument is quite big, while there is a need in having the smaller one, so the knowledge of scale conversion is also required. Besides that, the knowledge of raw material can be used to replace the real *gamelan* making material, i.e. metal, is also crucial. It is related to the work of deciding how the instrument can be played in appropriate manner and comfortably by the elementary students. The wrong choice of material used will lead to a difficulty of operating the *gamelan*.

Talking about the *gamelan* cannot be separated from arts field, particularly music. The *gamelan* is one of a famous traditional music instrument in Indonesia. There are many regions in Indonesia which have a specific local *gamelan*. Its way of playing resulting different rhythm and harmony system shows one of characteristics of various *gamelan* exist in Indonesia. In terms of making the *gamelan* model, choice of color is another aspect need to be taken into account. In this study, the object is the Javanese *gamelan* which, of course, has a relative different style of color performance. The *wilahan*, for example, is commonly provided in gold color, while the body of the *gamelan* itself, in general, is colored with red or green. However, this color is shifting as different users move to the other color based on their interest. So, in this case, there is a sense of color consideration in producing the model of *gamelan*.

CONCLUSION

Based on the above results and discussion, it can be concluded that the *gamelan* trigger is one device can be used as an aid to support music learning in elementary school. The process of designing this trigger involves some stages which employ both arts and science fields, two different important areas which work simultaneously in resulting the product which can provide many benefits for the school and students as the user.

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