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Literacy and numeracy: an example of developing module incorporating Aceh culture into mathematics

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Abstract

The focus of this study was to construct module based on local culture for elementary school students under Research and Development procedures. The participants of this study were the state elementary school students of *Muara Satu* Lhokseumawe. The data were analyzed in accordance with ADDIE (Analysis, Design, Development, Implementation, and Evaluation) research development. The results of this study suggested that the integration of local culture in elementary school students' module were evaluated to be valid by teaching module experts in terms of media, materials, and language. In addition, the developed-local culture module was regarded feasible and effective identified from students' performance having the average scores of 3.58 or 89.77 %. The feasibility and the effectiveness of the elementary school's literacy and numeracy module based on local culture were very appropriate to be applied in classroom. Hence, it is recommended that the development of the literacy and numeracy module based on local culture be further used in classroom.

Keywords: literacy; numeracy; module; local culture; developing.

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Introduction

The quality of education plays significant role and is also thought of as one of the important assets in Indonesia. The government has attempted to advance the education quality by providing current trends and educations innovations. Also, this was done to develop students' educational quality. The shift to a better condition of Indonesian educational system is known as the National Literary Movement (NLM), bolstering students' attitude as it is mentioned in the regulation issued by government (Ministry for Education and Culture, 2018).

In the new movement of regulation, students are required to have a fifteen minute literacy task. Various areas of literacy need to be crafted to students from providing the attitude based literacy content to a source which deals with local culture. Incorporation of cultural identity, the importance of ancestral language, and culture were pointed out to be fundamental in teaching mathematics as it increases students' intellectuality and knowledge. Students would find it meaningful, relevant and stimulating to learn mathematics when it is taught aligned with their values of culture and community (Lipka et al., 2007; Kisker et al., 2012; Gustein, 2016).

In addition, students are emphasized to learn in the area that grows their critical thinking skill using printable, visual, digital and auditory materials. The use of such designs is done to make students more literate in reading, writing, numeracy, science and culture (Sari, 2018; Fath et al., 2018; Rochmah & Bakar, 2021).

The need of improving students' educational policy acts as a fundamental need, students are compulsory to undergo the process of having a good education system in that they are able to deal with the challenges ahead fulfilling their needs becoming more proficient and viable in their striving's stages for better future. Hence the structure of education must be revised and developed in line with the current's need. It is stated that students are more capable, more dignified, and more intelligent, benefited from revising the quality of education system. Good education provides a path for student to a number of aspects of literacy needs (Novitasari, 2017; Syawaluddin & Nurhaedah, 2017; Purwasih et al., 2018).

Following the inception and the application of National Literacy Movement (NLM), the government has been persistently and progressively continued giving strong attention through accommodating a profound evaluation at schools' literacy and numeracy. The movement does not only focus to strengthen students' literacy ability but also to develop their competencies. These are referred to additional learning packages that drive them to have literacy in terms of numeracy, science, digital, financial, and culture. There are three main suggested stages of activities students have to go through from habituation process and development to learning (Ministry of Education and Culture, 2018).

According to Muliana et al. (2021), the terms media literacy is defined as a series of activities designed to develop students' control of media, by sending and receiving messages. More on this, Evans (2000) refers mathematical numeracy as an individual ability to form, analyze and apply the numerical, spatial, statistical and quantitative data in a way that corresponds to an appropriate context and cultural value.

The students' skill of literacy must be improved and taught in multiples of trajectories such as in numerical literacy through forming data interpretation and reasoning; a process of understanding and analyzing a text or an information and apply them through oral works and written forms (Han et al, 2017; Abidin et al., 2017; Sepriyanti et al., 2022).

Having an ability to perform a logical reasoning and conceptual ability is of paramount importance. It is argued that the learning objectives are obtained from this ability of deep thinking skill which is considered as a main goal in any educational settings and mathematical literacy and numeracy objectives in particular (Lithner, 2012; Basra & Fauzi, 2017; Segerby & Chronaki, 2018).

Indonesia has been characterized as one of the countries that was considered capable of and successful in reducing illiteracy. It was noted that the literacy rates in Indonesia reached a percentage of 92.8% for the adult group, and 98.8% for the youth. This achievement implies that Indonesia has prevailed over the stage of a literacy crisis in terms of literacy (United Nations Development Program, 2014).

However, the insufficiencies of the availability of books were regarded as the main challenges that most students faced with. Besides, students' lacking motivation and interest have worsened the learning situation. These problems are so concerning that students are demanded to have strong literacy skill in understanding text or information (Ministry of Education and Culture, 2018).

In fact, the Indonesian's PISA (the Program for International Student Assessment) scores in the year of 2000 and 2018 were considered very low (Sari, 2018; Narut & Supardi, 2019, Syawahid, 2019).

The basic activity of students' literacy that can be applied in an elementary school is the literacy of numeracy. This learning activity has it that in an attempt to interpret numerical information, one has to deal with his reasoning ability. In the pursuit of the appropriateness of the application of the literacy process, we have undertaken series of steps to investigate the actual practice of this goal.

Based on our preliminary study at *Sekolah Dasar Negeri* (State Elementary School) 7 Muara Satu, Lhokseumawe, a close observation to school's students, we stumbled upon significant facts that the literacy program gathered was in serious gap to be compared to the literacy guidelines. We discovered that the literacy act had been conducted mainly in school's library without fully fulfilling the literacy standard guidelines issued by government, School Literacy Movement (SLM).

Furthermore, the analysis also revealed that teachers' innovations were not supported by their counterparts at their parallel class. Students' motivations for literacy task were also very low. They believed that performing the literacy was quite insignificant and boring. These drawbacks in literacy were also triggered by the insufficient trainings, which must be provided to the school's teachers. Hence, overcoming the above issues for better actualization of the literacy program, there must be a need to construct a supported literacy and numeracy material.

Therefore, a new supported learning module for the need of mathematical literacy and numeracy is so crucial that students must be equipped with contents that improve their

literacy skill. This study aimed at improving and helping students' literacy needs has been conducted in a way to develop a supported literacy module which was constructed based on local culture, Aceh.

Previous studies in literacy and numeracy have been conducted and the core problems of the program have also been investigated and theses were outweighed by the construction of a new mathematical literacy module. For example, Widiantari and Sariyas (2022) conducted a study in improving students' literacy of numeracy as well as character, the literacy problems were compensated by constructing the E-Module based Ethno mathematics. The developed E-Module was valued to have played its role as a successful and positive effect in increasing students' literacy of numeracy as well as their character.

Similarly, Sulistyani and Kusumawardhana (2022) conducted a study on the assistance in the preparation of minimum competency assessment oriented numeration modules in an elementary school. They come across that the *Asesmen Kompetensi Minimum* (Minimum Competency Assessment) had been very effective and necessary for classroom use, making teacher easier to draw and arrange basic competency of students. A study of Jumadi and Arta (2021), it was revealed that the application of learning based STEAM (Science, Technology, Engineering, Art, and Math) could strengthen students' literacy of numeracy.

This study, however, differ the above findings in very particular variable in that it has been conducted to develop literacy module which were based on students' local culture, Aceh background. The scarcity of research per se, in which it was conducted to analyze and improve student's literacy of numeracy based Aceh culture, was very tangibly unavailable. In particular, this research applied questions items based Aceh culture in the elementary school's literacy of numeracy module.

Methods

This study employed the Research and Development (R&D) procedures since it was used to develop the literacy and numeracy module applied in elementary school students, *Sekolah Dasar Negeri* (State Elementary School) 7 *Muara Satu* Lhokseumawe. The development was designed based on the value of Aceh culture. Hence, the research model used in this investigation was the analysis, design, development, implementation and evaluation model (ADDIE).

Sugiyono (2018) states that the types of research and development model were applied when the data dealt with and underwent the process of construction and development done for a certain product or goal in that it could be examined to see their effectiveness. Branch (2009) referred the research procedures as a product development concept having several steps to be taken into account.

The research and development procedure was regarded very appropriate to be applied because it could examine, modify, research and develop academic and learners' need to an improved-product based on what happened in educational settings (Gulzar, 2015; Gustiani, 2019).

The body of this research was thoroughly gone through the analysis, design, development, and implementation processes, applied in the development of the elementary school students' literacy and numeracy module (see figure 1). From the initial stage, the analysis was very much closely related to an early observation of the module used the elementary school. This analysis process collected the information on the current module used and the alternative preference of the module was presented.

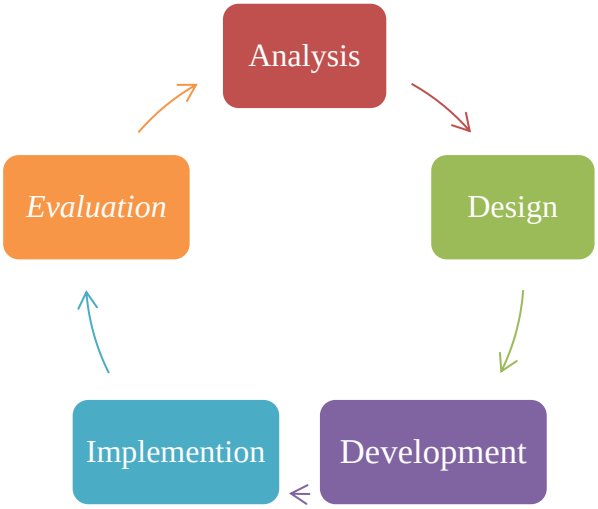

Figure 1. ADDIE Research Development Model

The development of new literacy and numeracy module have been done to promote the quality of teaching and learning, stimulate students' motivation of learning, and support students' literacy and numeracy skill. Once the problems have been investigated, the stages of the design of research and development procedure were applied, mostly associated with the construction of the literacy and numeracy module based on Aceh culture.

Having designed the module, the literacy and numeracy products underwent the development stage. In this part of procedure, the detailed review of the module was done. This investigation was performed to value and examine the module in terms of its design, pictures and language having a greater contrast of differences with the literacy and numeracy module currently used in the elementary school. The inspection of the attributes of the module was done by two different experts, the media and materials.

The implementation stage was done by two different trials of the product namely the limitation and application test. The limitation test or small group scale trial defined the use of questionnaires, a number of 9 students acted as the subject of this study overviewed the new developed module based on their local culture in terms of its feasibility of media used. Having done the first trial of the product, the develop module was ready to disseminate to students of *Sekolah Dasar Negeri* (State Elementary School) 7 Muara Satu Lhokseumawe. Students were asked to fill out questionnaires gathering their response to the literacy and numeracy product.

The last stage of the development was to evaluate the developed literacy and numeracy module. The revision of product took its turn in this stage; the process was given in

accordance with students' responses of the product resulted at the previous stages. In addition, the adjustment of the created module was also done by considering the response and evaluation valued by two experts. The effectiveness of the use of the developed literacy and numeracy module was subsequently revised based on the performance of students' test of the exploited test items used in the new module.

The further trial of the developed module examined its feasibility, practicality, and the effectiveness; the developed literacy and numeracy module based on Aceh culture. The process of this evaluation exerted into two stages of trials. The first was known as media and material expert evaluation while the second was recognized as the trial of the implementation of the literacy product.

The evaluation of the literacy and numeracy module in terms of its feasibility and the effectiveness of media along with its materials used was conducted, validated and assessed by linguistics experts. The latter trial of the product was conducted to a small group consisting of a number of 9 students. This stage was also important in which the developed module went through its advanced revision before it was disseminated for the trial in a number of large group consisting of 35 students.

Having gone through the second stage of trial of the large group, the literacy and numeracy module was analyzed and revised. The interpretation of feasibility range of media was crucial and this study has been used the criteria provided by Baharudin and Cholik (2021).

The literacy and numeracy module for the elementary school students which was designed based on Aceh culture were examined to unearth the feasibility which was validated by expert using guidelines taken from Ismiyanti (2021). The classification of the validation of the module, the Likert scale model was used which was appropriate to be used for the substantiation of the product (Sugioyono, 2018).

Meanwhile, the practicality test of the developed literacy and numeracy module was conducted to the elementary school teachers emanated from the responses that were earlier made by students. The effectiveness analysis was carried out by measuring the level of student learning mastery after using the literacy and numeracy module based on Acehnese culture.

Adawiyah et al. (2021) states that student learning completeness can be calculated by using particular criteria. Classifying the level of effectiveness of the elementary school's literacy and numeracy, the classical completeness criteria was used. This means that a class is considered having a completeness of learning if the amount of percentage is greater or equal to a number of 85% students completed their task.

Results

This study was done through Research and Development (R&D) model consisting of five stages. The result of the stage of analysis, it was found that there were no literacy and numeracy previously developed and distributed to *Sekolah Dasar Negeri* (State Elementary School) 7 Muara Satu Lhokseumawe. Students were also encountered to have less motivation to do the literacy task.

The evaluation of the design stages discovered the cover and the layout as well as the design of contents of the developed module which can be seen as in the following figure.

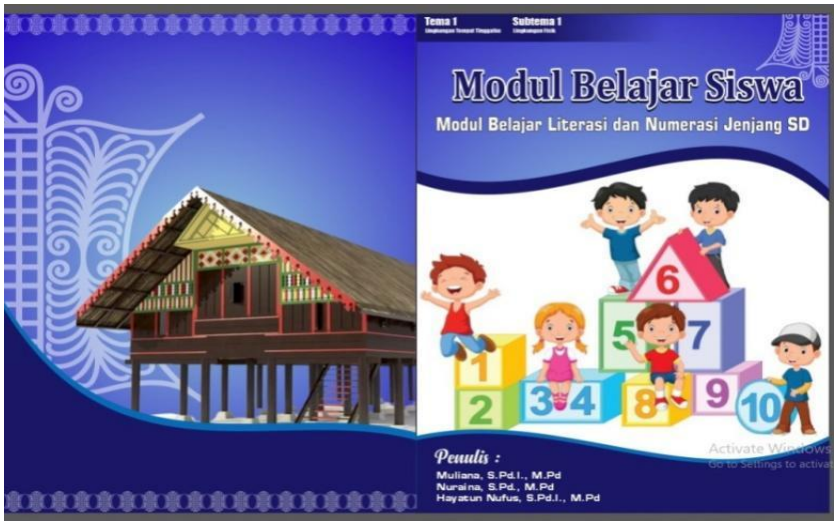

Figure 2. Literacy and numeracy module cover

From the figure above, it can be noted that the design of the elementary school students' module have been created in accordance with Aceh culture by adding the image of Aceh typical house. Students found it meaningful as they could figure out and reflected on the actual image.

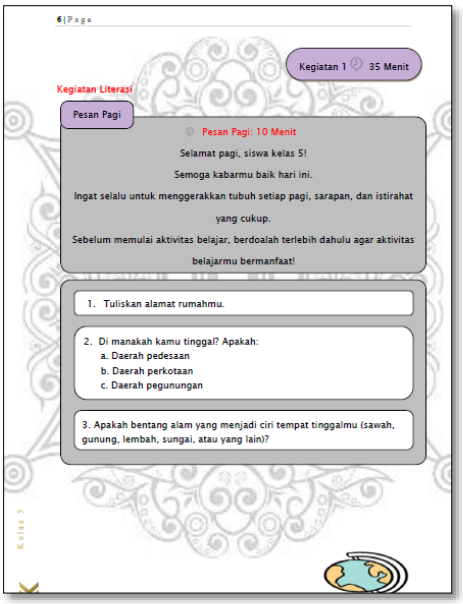

Figure 3. Students' numeracy activity

The figure 2 indicates that the task have been undertaken by students that directed them to perform a simple calculation activity. They were instructed to fill out numbers in the circle that the total of each side having an equal point with another. In part of the analysis of development of the literacy and numeracy module, it was discovered that the material and media were regarded very valid.

Table 1. The experts' validation of material

No.	Criteria	Indicators	Material Expert 1	Material Expert 2
1.	I. The	A. The completeness of materials	12	10
2.	feasibility of	B. Accuracy	18	18
3.	content	C. Updates	8	8
4.		D. Curiosity	7	8
5.	II. the	E. Techniques	4	3
6.	feasibility of	F. Supplementary presentation	20	20
7.	content	G. Learning presentation	3	4
8.	presentation	H. Coherence	8	6
9.	III. Culture	I. The nature of Aceh culture	7	7
10.	Feasibility	J. Cultural components	15	15
		Total	102	99
		Percentage %	91,07	88,39
		Category	Very Valid	Very Valid
		Average	3.64	3.53

It can be inferred from the table 1 above that the validation of material by the two experts revealed a significant outcome; the materials used were validated very valid. This validation can be seen from assessing score made by the first material expert, 91.07% while the second expert gave the validation marks as much as 88.39 %.

The media used in the literacy and numeracy module based on Aceh culture was evaluated revealing the following findings.

Table 2. The expert validation of media

No.	Indicators	Media Expert 1	Media Expert 2
1.	A. Module Size	6	8
2.	B. Cover Design	22	25
3.	C. Content Design	57	64
	Total	85	97
	Percentage	78.70	89.81
	Category	Valid	Very Valid
	Average	3.14	3.59

Based on the above table, it can be conveyed that the percentage of the literacy and numeracy module of the first media expert is 78.70% and it is considered valid. Meanwhile, the validation of the second expert value as much as 89.81 and it was considered very valid.

The appropriateness of language used in the developed literacy and numeracy module was validated and examined by two linguistics experts as in the following table.

Table 3. The evaluation indicators

No	Indicators	Expert 1	Expert 2
1	Using standard and appropriate Grammar	3	3
2	Using accordance terms with the subject	4	3
3	Using simple and easy phrases	4	4
4	Using communicative language	4	4
5	The accuracy of language use	3	4
6	Sentence selection is conveyable to the message	4	4
7	Simple and Straight right sentences	3	4

8	The accuracy of spellings	3	3
9	The consistency use of terms	4	4
10	The consistency use of symbols or icons	4	4
	Total	36	37
	Percentage	90	92.5
	Category	Very Valid	Very Valid
	Average	3.6	3.7

The table 3 above shows that the percentage of literacy and numeracy module for elementary school based on Aceh culture was validated by the first expert gained 90% and it was considered as very valid. The percentage validation of the second expert was 92.5%, which was also classified as very valid. Hence, this result of validation was used for subsequent module evaluations.

The cover of the developed module which was used to improve students' literacy and numeracy was revised in two different stages. This modification of the cover was of paramount importance. The figure 3 (a) illustrated that the cover was designed without the insertion of the typical Acehnese's house. The expert media validated the cover and the typical local house was added which was done in second revision of module as in the following figure.

Figure 4. Literacy and Numeracy Product **(**a) Before revision (b) After revision

The trial of the product, the literacy and numeracy module, was conducted to examine its attractiveness, by a number of 9 students who were involved in this stage. The respondents, the elementary school students of Muara Satu Lhokseumawe were asked to give their views through questionnaires directing them to value the attractiveness of the module.

Table 4. Small group average scores

No.	Initials	Total Scores	Average Scores	Percentages (%)	Criteria
1.	P1	49	3.5	87.5	Very Valid
2.	P2	50	3.57	89.28	Very Valid
3.	P3	51	3.64	91.07	Very Valid
4.	P4	50	3.57	89.28	Very Valid

5.	P5	53	3.78	94.64	Very Valid
6.	P6	52	3.71	92.85	Very Valid
7.	P7	45	3.21	80.35	Valid
8.	P8	43	3.07	76.78	Valid
9.	P9	43	3.07	76.78	Valid
	Overall Average		3.46	86.50	Very Valid

The table 4 showed that the results of students' response, in a number of 9 students took part in this study, were considered valid. From the initial P1 students to P6 and P9, the validity percentage criteria were all in very valid criteria. Three respondents overviewed the literacy and numeracy module to be valid. It can be inferred that the overall percentage and the average score were 86.50 % and 3.46 allowing the module had been implemented in the large trial of tested group.

Table 5. Large group average scores

Initials	Average Scores	Percentages (%)	Criteria
MF	3.42	85.71	Very Valid
MRA	3.5	87.5	Very Valid
MZB	3.5	87.5	Very Valid
RF	3.57	89.28	Very Valid
FA	3.5	87.5	Very Valid
PA	3.85	96.42	Very Valid
AA	3.85	96.42	Very Valid
MJ	3.35	83.92	Very Valid
HM	3.85	96.42	Very Valid
MSF	3.64	91.07	Very Valid
AM	3.5	87.5	Very Valid
SA	3.57	89.28	Very Valid
IN	3.42	85.71	Very Valid
AS	4	100	Very Valid
TA	3.5	87.5	Very Valid
ZS	3.42	85.71	Very Valid
ZA	3.64	91.07	Very Valid
AP	3.78	94.64	Very Valid
NA	3.42	85.71	Very Valid
AS	3.28	82.14	Very Valid
NR	3.42	85.71	Very Valid
H	3.92	98.21	Very Valid
Overall Average	3.58	89.77	Very Valid

The overall average scores of 22 students who were involved as respondents in this study as indicated in the table 5 was 3.58 while the overall of the percentage was 89.77 %. In accordance with students' response made on the developed literacy and numeracy module based on Aceh Culture was deem to have a worthy of use and it was regarded and

evaluated as the very valid sources in their literacy and numeracy task. In short, it can be inferred that the module is very appropriate to be used for the source of literacy and numeracy's need at the state elementary school, Sekolah Dasar Negeri 7, Muara Satu, Lhokseumawe.

Discussion

Referring to the result of the development of the literacy and numeracy module, it was found that the product which was constructed reflecting Aceh culture can be applied for elementary school students. The module was tested, examined, validated, and evaluated into several systematic stages. It was performed with a research model used the analysis, design, development, implementation, and evaluation; a framework of procedures in which the final form of distributed literacy and numeracy module had gone through. Furthermore, the validation stages done by two lecturers of Malikussaleh University in terms of material and media use put forward the importance of the use of the literacy and numeracy module as an additional source for the learning of mathematics.

The validation of the literacy and numeracy module was valued 78.70%. It was worthwhile to additionally use in classroom, aligned with the figures of validation given by the first expert of media. The other evaluator gave a royal value of 89.82 %, assigned in the level of very valid. The materials used were regarded appropriate in as much as percentage of 91.07% and 88.39 %, consecutively evaluated by the two material experts. The media and materials used were synonymous with the value of Aceh culture, in addition to the language used; the module was easy to be comprehended by the elementary school's students. In this case, Maesyarah (2018) states that the response of students is considered positive if the attained-score settled within the interval of $81 \leq \text{Value} \leq 100$, recognized as vary valid criteria. The literacy and numeracy module has been designed so attractive a mathematic learning source that students were motivated to learn, constructed based on Aceh culture.

The analysis of questionnaires revealed that of the two different respondents assigned and taken from different groups, the trial result of the large group had greater percentage valued 89.77 %. While in the product of module tested in small group of students attained as much as 86.50 %.

Hence, the result suggested that the module was thought very valid, positive and appropriate to be used for the all elementary school students as a teaching and learning source for flat-side space materials. Integrating with students' local culture, the literacy and numeracy of students were very proper and suitable for supporting their literacy and numeracy skill as they could reflect the mathematical concept in their real life. These findings were synonymous with those of Jana and Kintoko (2019) in that the local culture is very suitable to be employed in students' teaching learning materials.

The development of the literacy and numeracy module was intended to assist the state elementary school teachers as it was made easier for them to convey, teach and have students comprehend mathematics. These result possessed a path that the module based Aceh culture could be applied for the elementary school students. Connecting teaching and learning

mathematic with the value of local culture helped students gain their learning motivation. Teacher thus should also be aware of and familiar with students' cultural identity as well as its value in that it can be used to connect their cultural and linguistic knowledge with school-based math (Lipka et al., 2007; Rickard, 2017; Nuraina et al., 2022).

Conclusion

The assessors held a mutual consensus on the appropriateness of the developed literacy and numeracy module. The designed mathematics literacy and numeracy source based on Aceh culture was very valid to have been developed. The first expert of media evaluation gained the percentage validation of 78.70 % and it was considered as a valid material. The second expert evaluated the module with 89.81 % and it was analyzed to be very valid. The first material expert's validation revealed the percentage of 91.07 % under the category of very valid. While, the second of expert of the material validated the module with the percentage of 88.39 % under the category of valid. The language used in the developed module was thought to be very valid with the percentage of 90 % and 92.5 % evaluated by two successive experts in linguistics. The feasibility and the effectiveness of the literacy and numeracy module based on Aceh culture was weighed and viewed by students involved in this study. The data from the trial of the literacy and numeracy product of the large group marked the total of the average score of 3.58 with the percentage of 89.77 %. These findings can be concluded that the developed literacy and numeracy module based on Aceh culture was very appropriate and feasible to be further employed in the teaching and learning process, which can be used without having any differences for both in group work or individual task.

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Conflict of interest

The authors declare that no conflict of interest regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancies have been completely by the authors.

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