THE EFFECT OF STEM PRACTICES ON ACADEMIC ACHIEVEMENT AND ATTITUDES OF SIXTH GRADE STUDENTS: AN APPLICATION ON THE UNIT OF FORCE AND MOTION

Maide Mihriban Akkaya
Ministry of National Education

***Semra Benzer**
Department of Science Education, Gazi University
**sbenzer@gazi.edu.tr*

ABSTRACT

The aim of this study is to investigate sixth grade students' academic achievement and their attitudes towards STEM practices applied in the unit of "Force and Motion" of science course book. In the study, experimental research design with randomly selected pre-test post-test groups was employed. The study was conducted with sixth grade middle school students enrolled in a state school in Hakkari in 2018-2019 academic year fall term. A total of 40 students were included in the study. STEM practices developed in accordance with STEM lesson plan were done with experimental group students. As for control group students, lessons were carried out according to the lesson plan on the curriculum. Validity and reliability of Academic Achievement Test applied to both experimental and control group students as pre-test and post-test was tested and Cronbach alpha level was found as 0.84 post-test. Both groups were also administered STEM Attitude Scale as pre-test and post-test. Validity and reliability of STEM Attitude Scale was tested, and Cronbach alpha level was found as 0.905. The quantitative data of the study was analysed on a statistical package program. Results indicated an improvement in experimental group students' academic achievement, attitudes, and opinions on STEM practices.

Keywords: *Force, Motion, Stem, Academic Achievement, Attitude, Opinion*

INTRODUCTION

The world has been improving and changing with the constantly developing technology. Therefore, several skills, called 21st century skills, are needed to be able to keep up with these changes. These skills can be exemplified as collaboration, teamwork, sense of wonder, and problem solving (Akgündüz et al., 2015). In today's world, individuals are expected to utilize the information they gained with these skills in real life (Bahar, Yener, Yılmaz, Emen, & Gürer, 2018; Beane, 1995). There are several educational approaches embracing such features. One of these approaches is STEM education. STEM education includes Science, Technology, Engineering, and Mathematics fields. STEM education aims at solving real life problems with the help of various disciplines and ensuring an interdisciplinary integrity (Şahin, Ayar, & Adıgüzel, 2014). In another definition, STEM education is described as an educational approach which is based on the use of scientific research techniques, engineering and design knowledge in solving a problem (Çepni, 2017). This education involves every field of study from preschool education to higher education. An individual receiving STEM education can utilize advanced cognitive skills and develop authentic products (Gülen & Yaman, 2018). For an individual to bring out an authentic product, entrepreneurship is required. An entrepreneur can transform an abstract idea into a concrete product by taking responsibility. As the main goal of STEM education, an individual should solve daily life problems with stages of scientific research, engineering, and designing skills. Another goal of this education is to ensure integrity by establishing a connection between courses. In addition, increasing students' interest for Science, Engineering, Design, and Mathematics and motivating them towards STEM related professions is another goal of this education. In STEM education, students are expected to explore the information on an issue while solving a problem (MEB, 2016). Organizing and revising educational programs according to STEM education can provide a solution for the problems encountered in educational systems / in real life (Yıldırım & Altun, 2015).

When previous studies were reviewed, it is seen that students receiving STEM education in the curriculum are better in comprehending the topics comparing to those who do not (Bybee, 2010). Thus, STEM education can be an effective tool for countries experiencing low educational attainment.

First practices on STEM education were applied in the USA and then this education started to become widespread in other countries. In Turkey, there are several plans and reports on STEM education prepared by Ministry of National Education (MNE). The first act in MNE regarding STEM education was undergoing a revision in the curriculum. With the revised curriculum, STEM education was started to be included in course books. With this revision, MNE aims at increasing success level of students in national and international tests and providing students with 21st century skills (MEB, 2016).

Many researchers have been investigating the effects of STEM on individuals according to several variables. In the study by Knezek, Christensen, Tyler-Wood, and Periathiruvadi (2013), it was concluded that STEM perceptions of middle school students positively changed at the end of the study. Cho and Lee (2013) prepared a lesson plan based on STEM in order to analyse the effect of STEM on 6th grade students' creative personality skills, problem solving skills, and learning levels. Dischino, Massa, Donnelly, and Hanes (2009) utilized an educational system, which is a combination of problem-based learning and STEM education, in their study conducted with high school students and found that the educational system employed in the study was a very significant factor in preparing students for life. Gottfried (2015) conducted a study to investigate the effect of applied STEM education courses offered at the beginning of high school education on students' choice of taking advanced mathematics and science courses and on their attitudes and motivation towards environment. In a study by Ciascai and Popa (2017), it was observed that STEM education had a positive impact on future career choice of high school students. In addition, when the literature is reviewed, STEM education is seen to be effective in helping students comprehend the subjects fast, and being active in the class (Riskowski, Todd, Wee, Dark, & Harbor, 2009; Schnittka & Bell, 2011; Wyss, Heulskamp, & Siebert, 2012; Karahan, Canbazoğlu-Bilici, & Ünal, 2015; Afriana, Permanasari, & Fitriani, 2016; Öner, Capraro, & Capraro, 2016; King & English, 2016; Dönmez, 2017; Altan, Üçüncüoğlu, & Zileli, 2019).

The present study conducted with considering previous studies aims to investigate sixth grade students' academic achievement and their attitudes towards STEM practices applied in the unit of "Force and Motion" given in science course book. The main and sub research questions of the study was developed by considering the learning outcomes of the topic of "Resultant Force" in "Force and Motion" unit as presented below. The main research question of the study is:

Do STEM activities applied in Force and Motion Unit have an effect on sixth grade students' academic achievement and attitudes? The sub questions of the study are:

1. Do experimental and control group students' academic achievement show a statistically significant difference before and after the study?
2. Do experimental and control group students' attitudes towards STEM education show a statistically significant difference before and after the study?
3. Do experimental and control group students' academic achievement and their attitude towards STEM education show a statistically significant difference before and after the study in terms of gender, science course point average, and their preferred area of profession?

METHODOLOGY

In this study on STEM practices applied on the topic of "Resultant Force" in "Force and Motion" unite of 6th grade science course book, experimental research design with randomly selected pre-test and post-test groups was employed. Data obtained through experimental studies can provide more accurate results than data obtained with other research techniques. This results from the fact that there is comparable data to be used by the researcher (Büyüköztürk, Kılıç Çakmak, Akgün, Karadeniz, & Demirel, 2016).

After the groups were randomly selected, they were administered pre and post-tests. Each experimental and control groups consisted of 20 students. The study was conducted for 7 weeks in 2018-2019 academic year fall term. STEM practices developed in accordance with STEM lesson plan were conducted with experimental group students while constructivist education was carried out in control group. Lessons were conducted according to lesson plan and curriculum provided by MNE in control group.

Academic Achievement Test (AAT) and STEM Attitude Scale (SAC) were used as pre and post-test in both groups. After the pre-test, "Making Equal Arm Scale, Bridge Building, and Catapult Building" determined as STEM activities were applied in experimental group while "What are the Properties of Force?, Different Forces Different Effects, Equal and Opposite Forces" activities provided in 6th grade science course book were applied in control group.

Experimental and control group students were then divided into 4 sub-groups during the activities. There were 5 students in each sub-group. At the end of the activities, experimental and control group students were administered AAT and SAC.

Working Group

The study's population consisted of sixth grade middle school students who enrolled in a state school in Hakkari, Turkey in the 2018-2019 academic year fall term. A total of 40 students where then divided into two groups; experimental group and control group, with each group consisting of 20 students. There were 14 girls (70%) and 6 boys (30%) in the experimental group. Meanwhile, in the control group, there were 12 girls (60%) and 8 boys (40%).

Data Collection Tool

Data of the study were collected through "Academic Achievement Test" and "STEM Attitude Scale".

Academic Achievement Test (AAT)

Academic Achievement Test was developed by the researcher by considering the learning outcomes of the topic of "Resultant Force" in "Force and Motion" unit of 6th grade science course book. The pilot study of AAT was conducted in the fall term of 2018-2019 academic year. The researcher developed 36 items (33 multiple choice and 3 open ended questions) out of previously asked test questions and Education Information Network (EBA) outcome tests. Expert's opinions were obtained from four experienced science teachers for the items. From the opinions of the experts and through item analyses, 16 items were excluded from the test and data were collected with the remaining 20 items. The results of the item analysis showed that Cronbach alpha reliability coefficient was 0.84. Difficulty index, discrimination index and included items of ATT are presented in Table 1.

Table 1
Difficulty and Discrimination Index of AAT

Item Number	D Index	Dc Index	Item Number	D Index	Dc Index	Item Number	D Index	Dc Index
1	0.33	0.19	13	0.50	0.18	25*	0.53	0.56
2	0.40	0.18	14	0.37	0.12	26*	0.67	0.60
3*	0.69	0.30	15	0.33	0.18	27*	0.84	0.74
4	0.25	0.10	16*	0.53	0.46	28*	0.66	0.41
5	0.15	0.17	17	0.62	0.14	29*	0.40	0.34
6	0.31	0.10	18	0.57	0.19	30*	0.76	0.51
7	0.13	0.04	19*	0.76	0.36	31*	0.64	0.48
8*	0.60	0.33	20*	0.42	0.54	32*	0.38	0.54
9*	0.60	0.56	21	0.31	0.14	33*	0.77	0.37
10	0.66	0.23	22	0.32	0.11	34*	0.31	0.60
11	0.35	0.12	23	0.34	0.16	35*	0.68	0.53
12*	0.43	0.37	24*	0.72	0.44	36*	0.82	0.32

(* Items selected for AAT), Difficulty: D, Discrimination: Dc

STEM Attitude Scale (SAC)

In order to determine experimental and control group students' attitudes towards STEM, STEM Attitude Scale (SAC) was utilized. SAC was developed by Faber et al. (2013) and was then adapted to Turkish by Yıldırım and Selvi (2015). SAC is a 5-point Likert-type scale consisting of 37 items. There are four sub-dimensions in the scale: mathematics (8 items), science (9 items), engineering and technology (9 items), and 21st century skills (11 items). The Cronbach alpha reliability coefficient of SAC is 0.90.

Data Analysis

In the analysis of AAT consisting of 20 items, having a correct answer is counted as 1-point, meanwhile, wrong answer is counted as 0 point. The SAC is a 5-point Likert-type scale consisting of 37 items. Out of the 37 items, 33 are affirmative and 4 are negative. Obtained data were then processed on statistical package program and analysed with the appropriate techniques.

FINDINGS

As the study population consisted of participants less than 50 people, Shapiro-Wilk technique was employed in normality test. Shapiro-Wilk technique is used in the determining whether data is normally distributed or not (Büyüköztürk et al., 2016). Normal distribution ($p > .05$) of AAT and SAC pre-test and post-test results are given in Table 2.

Table 2
Shapiro-Wilk Test Results of AAT and SAC

Scale	Group	Test	Statistics	N	p*
AAT	Experimental	Pre	0.94	20	0.25
		Post	0.94	20	0.35
	Control	Pre	0.83	20	0.35
		Post	0.93	20	0.22
SAC	Experimental	Pre	0.92	20	0.12
		Post	0.92	20	0.15
	Control	Pre	0.94	20	0.25
		Post	0.90	20	0.06

(* $p < .05$)

There is no statistically significant difference between AAT pre-test scores of experimental group and control group (Table 3).

Table 3.
T-Test Results Regarding Pertest Scores of AAT for Control and Experimental Group Students

Scale	**Group**	**N**	**x̄**	**S**	**t**	**p***
AAT	Experimental	20	5.35	1.69	2.64	0.08
	Control	20	3.50	2.62		

(* p< .05)

As can be seen in Table 4, when the pre-test and post-test scores of control and experimental group students were compared, there was a meaningful difference in favour of post-test scores of experimental groups. This difference may indicate the effect of STEM practices applied in experimental group on learning. When AAT mean scores of control group were analysed, there was no meaningful significant difference between pre-test and post-test scores. Though no meaningful difference was observed between the groups, post-test means scores were observed to be higher than pre-test mean scores.

Table 4
Results Regarding Pertest and Post-test Scores of AAT for Control and Experimental Group Students

Scale	**Group**	**N**	**Pertest**		**Post-test**		**t**	**p***
			x̄	S	x̄	S		
AAT	Experimental	20	5.35	1.69	13.80	4.32	8.13	0.00
	Control	20	3.50	2.62	5.50	1.60	1.64	0.10

(* p< .05)

There was a meaningful difference in favour of experimental group when post-test results of both groups were examined (Table 5). This difference may indicate the effect of STEM practices applied in experimental group.

Table 5
Results Regarding Post-test Scores of AAT for Control and Experimental Group Students

Scale	**Group**	**N**	**x̄**	**S**	**t**	**p***
AAT	Experimental	20	13.80	4.32	8.04	0.00
	Control	20	5.50	1.60		

(* p< .05)

Table 6 shows that there is no meaningful difference between two groups in terms of SAC pre-test mean scores. This may suggest that students' attitudes towards STEM practices were at the same level at the beginning of the study.

Table 6
Results Regarding Pertest Scores of SAC for Control and Experimental Group Students

Scale	Group	N	x̄	S	t	p*
SAC	Experimental	20	109.30	19.33	1.86	0.07
	Control	20	73.20	17.05		

(* p< .05)

As seen in Table 7, when SAC pre-test and post-test scores of experimental group students were compared, there was a meaningful difference in favour of post-test scores. As for control group, there was no meaningful difference between pre-test and post-test mean scores. These results indicate that the program applied in experimental group has a positive effect on students' attitudes towards STEM education.

Table 7
Results Regarding Pertest and Post-test Scores of SAC for Control and Experimental Group Students

Scale	**Group**	**N**	**Pertest**		**Post-test**		**t**	**p***
			x̄	**S**	**x̄**	**S**		
SAC	Experimental	20	109.30	19.33	141.65	22.45	4.88	0.00
	Control	20	73.20	17.05	74.10	18.00	0.16	0.87

(* p< .05)

When the results on Table 8 were analysed, there was a meaningful difference between post-test scores in favour of experimental group. This result indicates that applied STEM practices resulted in a change in students' attitudes towards STEM education. Results on the data regarding sub-dimensions of SAC applied in both experimental group and control group are presented in Table 9.

Table 8
Results Regarding Post-test Scores of SAC for Control and Experimental Group Students

Scale	Group	N	x̄	S	t	p*
SAC	Experimental	20	141.65	22.45	10.49	0.00
	Control	20	74.10	18.00		

(* p< .05)

Table 9
Results Regarding Pre-test and Post-test Scores of Sub-Dimensions of SAC for Control and Experimental Group Students

SAC	**Group**	**Test**	**N**	**x̄**	**S**	**t**	**p***
Mathematics	Experimental	Pre	20	1.70	1.34	5.66	0.06
		Post	20	2.89	1.24		
	Control	Pre	20	1.75	1.20	5.86	0.06
		Post	20	3.50	1.60		
Science	Experimental	Pre	20	1.95	1.46	10.15	0.00
		Post	20	3.80	1.28		
	Control	Pre	20	3.75	1.51	6.47	0.07
		Post	20	3.80	1.37		
Engineering	Experimental	Pre	20	3.85	1.65	3.69	0.11
		Post	20	3.10	1.22		
	Control	Pre	20	3.55	1.50	2.79	0.08
		Post	20	4.30	1.62		
21st Century Skills	Experimental	Pre	20	4.00	1.75	3.36	0.77
		Post	20	4.15	1.83		
	Control	Pre	20	2.10	1.06	3.93	0.23
		Post	20	2.15	1.42		

(* p< .05)

When pre-test and post-test mean scores of the sub-dimensions of SAC were analysed, no meaningful difference was observed in sub-dimensions of "mathematics, engineering, and 21st century skills" for both groups. In the pre-test post-test comparison of "science" sub-dimension of SAC, a meaningful difference was obtained in favour of post-test scores of experimental groups. This may result from the fact that applied activities include topics of science. No meaningful difference was found in control group in terms of "science" sub-dimension of SAC.

As seen in Table 10, results of AAT pre-test mean scores for both groups did not cause a meaningful difference according to gender. Also, when the results of AAT pre-test scores were analysed, there was no meaningful difference according to gender.

Table 10
Results of Experimental and Control Group Students' Pertest Scores of AAT and SAC According to Gender

Scale	Group	Gender	N	x̄	S	t	p*
AAT	Experimental	Girl	14	5.35	1.54	0.02	0.97
		Boy	6	5.33	2.16		
	Control	Girl	12	1.91	0.99	2.11	0.06
		Boy	8	3.25	1.83		
SAC	Experimental	Girl	14	106.71	12.63	0.90	0.37
		Boy	6	115.33	30.70		
	Control	Girl	12	74.58	21.32	0.43	0.66
		Boy	8	71.12	8.16		

(*p< .05)

When pre-test and post-test results of AAT and SAC were examined, AAT and SAC scores of experimental groups were observed to show a meaningful difference according to gender. This difference in experimental group was observed to be in favour of girls. In control group, pre-test and post-test of AAT and SAC did not show a meaningful difference according to gender (Table 11).

Table 11
Experimental and Control Group Students' Comparative Pertest and Post-test Scores of AAT and SAC According to Gender

Scale	Group	Gender	N	Pertest		Post-test		t	p*
				x̄	S	x̄	S		
AAT	Experimental	Girl	14	5.35	1.54	15.28	3.38	4.77	0.00
		Boy	6	5.33	2.16	10.33	4.54		
	Control	Girl	12	1.91	0.99	5.83	1.26	0.18	0.73
		Boy	8	3.25	1.83	5.00	2.00		
SAC	Experimental	Girl	14	106.71	12.63	142.85	22.79	0.45	0.01
		Boy	6	115.33	30.70	138.83	23.50		
	Control	Girl	12	74.58	21.32	76.41	22.61	0.68	0.63
		Boy	8	71.12	8.16	70.62	7.28		

(* p<.05)

When results of AAT post-test mean scores were examined according to gender, a meaningful difference was detected in favour of girls in experimental group. While results of AAT did not cause a significant difference in control group, results of SAC did not result in a meaningful difference in both groups according to gender (Table 12). Analysis of pre-test scores of AAT and SAC according to science course point average is shown in Table 13.

Table 12
Experimental and Control Group Students' Post-test Scores of AAT and SAC According to Gender

Scale	Group	Gender	N	x̄	S	t	p*
AAT	Experimental	Boy	14	15.28	3.38	2.71	0.01
		Girl	6	10.33	4.54		
	Control	Boy	12	5.83	1.26	1.14	0.26
		Girl	8	5.00	2.00		
SAC	Experimental	Boy	14	142.85	22.79	0.35	0.72
		Girl	6	138.83	23.50		

	Control	Boy	12	76.41	22.61	0.69	0.49
		Girl	8	70.62	7.28		

(*p< .05)

Table 13
ANOVA Results of Experimental and Control Group Students' AAT and SAC Pertest Data According to Science Course Point Average

Scale	Source of	Sum of	Mean	F	p*
AAT	Intergroup	12.86	6.43	2.62	0.10
	Intragroup	41.68	2.45		
	Total	54.55			
SAC	Intergroup	691.21	345.60	1.21	0.32
	Intragroup	4833.98	284.35		
	Total	5525.20			

(* p< .05)

When the results of AAT pre-test mean scores were analysed, no meaningful difference was observed according to groups. This indicates that science course point averages of both experimental group and control group were at the same level before the study although students in different groups have different science course point averages. When pre-test mean scores of SAC were analysed, no meaningful difference was found according to groups (Table 13).

The assessment of AAT and SAC post-test scores according to science course point average is given in Table 14.

Table 14
ANOVA Results of Experimental and Control Group Students' AAT and SAC Post-test Data According to Science Course Point Average

Scale	Source of	Sum of	Mean	F	p*
AAT	Intergroup	1.71	0.85	0.35	0.70
	Intragroup	41.23	2.42		
	Total	42.95			
SAC	Intergroup	31.20	15.60	0.81	0.45
	Intragroup	324.00	19.05		
	Total	355.20			

(* p< .05)

AAT post-test mean scores did not cause a meaningful difference in both groups. When the results of SAC were analysed, experimental group and control group students' pre-test scores of SAC did not show a meaningful difference according to groups (Table 14). This result shows that there is no meaningful difference between students' science course point average (with science achievement grade received in the previous semester) and their SAC post-test scores.

In the current study, the variable of students' preferred area of profession was also investigated on AAT and SAC. Areas of profession were divided into four groups: science, mathematics, engineering, and social sciences. Students who preferred "science" stated that they would like to be a doctor or dentist; those who preferred "mathematics" stated that they would like to be a bank officer or mathematics teacher; those who preferred "engineering" stated that they would like to be mechanical engineer or civil engineer; and those who preferred "social sciences" stated that they would like to be a lawyer or member of parliament.

When the pre and post-test results of AAT were analysed, experimental and control group students show no meaningful difference according to groups they are in. Similarly, when pre and post-test results of SAC were examined, the mean scores did not show a meaningful difference according to groups.

DISCUSSION

In this study, when the pre-test results of experimental and control group students' academic achievement were analysed, no meaningful difference was observed between the two groups. This result indicates that students in both groups had equal level of readiness before the research was conducted. When the mean scores of the post-test for the experimental and control group students' academic achievement were compared, a meaningful difference was observed in favour of experimental group. This result demonstrates that applied STEM practices increased the students' success level. Results of academic achievement obtained with this study show that STEM education and STEM practices have a positive effect in increasing students' academic achievement. Several studies proving the positive effect of STEM practices on student success confirm the results of the present study. In their study carried out with 8th grade students, Doppelt et al. (2008) found that students became successful in science course with design-based learning. Ceylan (2014) also conducted a study with 8th grade students and confirmed that STEM activities increased student success and they developed positive attitudes towards 21st century skills. Afriana et al. (2016) found in their study conducted with 7th grade students that there was a development in success and interest for science course in the group where students carried out STEM activities. Also, when the literature is reviewed, results of the studies on STEM practices carried out by (Lou, Shih, Diez, & Tseng, 2011; Yadav, Subedi, Lundeberg, & Bunting, 2011; Kırgız & Koyuncu, 2016; Öner et al., 2016; İnce et al., 2018; Yıldırım & Selvi, 2017; Ergün & Balçın, 2019) confirm the results obtained in this study regarding academic achievement.

In this study, no meaningful difference was detected between pre-test scores of experimental and control group students with regards to attitudes towards STEM education. This may suggest that experimental group and control group students' attitudes towards STEM education were at the same level before the activities. Concluded that after the STEM practices, students developed positive attitudes towards STEM practices. Results of previous studies on attitudes towards STEM carried out by (Lou et al., 2011; Ceylan, 2014; Yıldırım, 2018; Karahan et al., 2015; Chang & Wahono, 2018; Özkurt Sivrikaya, 2019) are consistent with the results obtained in the current study.

A meaningful difference was found in "science" sub-dimension of only experimental group as a result of the analysis made on sub-dimensions of SAC. In a study by Chacko, Appelbaum, Kim, Zhao, and Montclare (2015) conducted with high school students, students developed a positive attitude towards "science" field with the adaptation of the program to STEM education. This result is in line with the result obtained in the current study. When experimental and control group students' pre-test mean scores of AAT and SAC were analysed according to gender variable, gender was seen to cause no meaningful difference for both groups. When experimental and control group students' pre-test and post-test mean scores of AAT and SAC were examined, a meaningful difference was detected in both scales in favour of girls in experimental group. Though groups were randomly selected in this study, the number of girls in both groups were higher than boys, which may affect the results. The result obtained from the gender variable of AAT and SAC is consistent with the results of previous studies in the literature. The study by Cooper and Heaverlo (2013) conducted with middle school and high school students; the study by Knezek et al. (2013) conducted with middle school students; the study by Bannikova, Boronina, and Kemmet (2016) conducted with university school students; and the study by Screpanti et al. (2018) conducted with high school students concluded that girls were more interested in STEM fields. When pre and post-test mean scores of AAT and SAC were examined according to science course point average and preferred areas of profession, no meaningful difference was observed between pre and post-test mean scores of science course point average and preferred areas of profession.

CONCLUSIONS

Results of academic achievement obtained with this study show that STEM education and STEM practices have a positive effect in increasing students' academic achievement. Several studies proving the positive effect of STEM practices on student success confirm the results of the present study. On the basis of the findings presented in this paper, it can be concluded that STEM activities help students to become more active in learning. Therefore, the importance of STEM education and studies on STEM education should be included in course books of MNE and teacher guides. Some STEM activities take a long time to apply. To overcome this, the duration of the science course can be extended. Students' readiness for the topic should be tested before the research and lesson plans should be developed by taking level of readiness into consideration. The number of labs and workshops to carry out STEM activities should be increased to provide a comfortable setting. The number of materials should be increased as well, according to the activity and product diversity should be provided. The role of the teachers should be as a guide in conducting activities and they should be able to respond to students' questions. Activities offering active involvement result in permanent learning. Thus, such STEM activities can be done not only in the science field but also in social sciences field. In order to adequately carry out STEM education, both students and teachers should be well trained. Teachers can be informed and trained on STEM education by both MNE and universities. With the help of such trainings, teachers can offer a more effective learning.

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