

# Effects of Simulation, Socio-Economic Profile, and Attitudes on the Academic Performance of Students in Technology and Livelihood Education (TLE)

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## Abstract

This study investigated the effects of a cooking simulation approach on students' academic performance in the subject Technology Livelihood Education (TLE) among fourth-year high school students of the MSU-Wao Community High School. A total of 92 secondary students were selected to participate in the study from an intact pilot sample who took the TLE subject. A semi-structured questionnaire was used to collect data in a two-group pre-test post-test quasi-experiment design. Data were analyzed using descriptive statistics, independent samples t-test, and the Pearson product moment correlation. Findings revealed that the majority of the fourth-year high school students were female, aged between 15 and 16 years old, whose parents had attained a college education and have a moderate family income, and a small family size. Students in both the simulation and convention groups have positive attitudes toward TLE. Moreover, the fathers' level of education attainment and family size have an impact on the students' academic performance. Their level of academic performance was proficient based on their knowledge and skills in TLE, especially in cooking lessons. The academic performance of students has significantly improved when using cooking simulation. Students in the simulation group have demonstrated better proficiency and interest in the TLE subject. The findings of the study indicate that a simulation teaching approach has a positive impact on students' academic performance. Hence, teachers are encouraged to use simulation or actual learning activities in teaching TLE lessons to enhance students' academic performance and stimulate their educational experience.

**Keywords:** simulation; socio-economic profile; attitude; academic performance

## 1. Introduction

In a teaching-learning situation, the thrust of an education institution is to be more active and learner-centered. Teachers are expected to explore more creative and innovative methods and strategies in order to attain students' meaningful learning and improve academic performance. One of these educational techniques is to use learning-oriented instruction that facilitates active learning, an example of which is simulation.

Real-world learning experiences and authentic activities are effective strategies to enhance learners' interest and motivation to learn. Research findings (Blanchard & Donahue, 2007) revealed that teaching students in realistic situations such as simulation techniques allows them to participate actively. This could also develop their affective, behavioral, and cognitive domains in learning.

Hence, to improve classroom instruction through active learning using real-world situations, the use of simulation has been recognized. This kind of strategy is effective in developing students to have more practical skills and become independent and creative thinkers, thereby increasing students' engagement and participation. The integration of simulation into a course is one teaching strategy that can serve to align classroom and real-world expectations.

The use of a simulation technique in teaching promotes students' active participation and develops their cognitive ability and affective and behavioral domains toward the lessons and the subject. Deep learning can be enhanced by engaging students in instructional simulations and empowering their understanding, thinking skills, and cognition (Blecha, 2013).

Simulation has been integrated into many subjects, one of which is technology and livelihood education (TLE). TLE includes lessons in agro-fishery arts, industrial arts, entrepreneurship, home economics, and commercial cooking. The Department of Education (DepEd) emphasized that teaching TLE subjects must be in the form of developing the learners' skills through hands-on, experiential, contextualized, and authentic activities. Thus, integrating simulation in teaching TLE is essential in developing students' skills through learning by doing. As such, the researcher, being a TLE teacher in MSU-Wao Community High School, deemed it proper to determine the effects of using a cooking simulation approach in the academic performance of students as part of the TLE lesson and activities. In addition, the socio-economic profile and attitude towards learning are considered in literature as factors to be predictors of academic achievement in subjects such as English, Science, Reading and Mathematics. Hence, another purpose of the study is to determine the relationship of the variables investigated in the study.

## **2. Method**

### **2.1. Participants**

The respondents of the study were the two intact classes of fourth-year students of the MSU-Wao Community High School. The classes were grouped according to an experimental group and a control group. The experimental group was composed of 45 students who were taught using TLE lessons with a simulation approach through actual cooking activities, while the control group consisted of 47 students who were taught using TLE lessons in a conventional method, that is, without cooking simulation activities.

### **2.2. Design**

This study utilized a descriptive-comparative-correlation method. This is descriptive research in an attempt to describe the socio-economic profile of the respondents in terms of age, gender, parents' educational level, family monthly income, family size, and attitude toward TLE.

In addition, comparative research is also referred to as experimental design and pre-test post-test design. This method is used to evaluate students' performance before and after the intervention to measure the effectiveness of the given intervention (Encyclopedia of Research, 2014). This study therefore is comparative specifically using a two-group pre-test post-test design as it attempted to determine the effect of and difference in teaching TLE lessons with or without cooking simulation. Two groups of intact classes in their fourth year were involved in this study to test the effects of teaching cooking simulations in relation to the academic performance of high school students.

Furthermore, a correlation research design attempts to explore what degree of relationship exists between two or more variables. Hence, it was correlation research because it attempted to trace the relationship between the independence variables and academic performance of students in TLE.

### **2.3. Materials**

This study utilized a questionnaire which involved questions regarding the socio-economic background of the respondents and the constructed laboratory activity sheets and manual that contain lessons on TLE cooking, especially in Native Maranao Cookery. The test was designed to measure the performance level of fourth-year students and was subjected to validation testing for its reliability and validity. The questionnaires were presented to participants to be answered (Appendices A, B, & C).

### **2.4. Procedure**

A letter requesting permission was sent to the principal of MSU-Wao Community High School. After approval, data were collected from the two intact classes of fourth-year students in MSU-Wao Community High School. Prior to conducting the cooking simulation, students were allowed to take the pretest. In the experimental group, after the simulation had been conducted in the students' laboratory Technology and Livelihood Education (TLE) class, a post-test examination was conducted. In the control group, pre-test and post-test scores were collected without the integration of cooking simulations. Data were then collected, statistically analyzed and interpreted.

## **3. Results and Discussion**

### **3.1. Socio-Demographic Profile of the Respondents**

The results revealed that 83% of the student respondents are in the age bracket of 15 to 16 years old, as indicated in the Philippines Standard Classification of Education, 61% are female, more than 50% have families earning Php 20,000 above, more than 50% also have parents who either reached or graduated from college, and 80% have families with an average of four members.

Considering that the majority of the students are female with only 39% males, this implies that gender plays a role in the performance and motivation of students. Grossman and Grossman (as cited by Davis, 2009) and the study suggested that males and females have different achievement levels. The study has shown that generally, female students perform better in school than male students, usually obtain higher grades, and have a higher rate of completion of their studies Zembar & Blume, 2011).

In terms of monthly family income, the results indicate that most of them belong to middle-income families. Teachers and school factors can help students improve their academic learning. However, family factors also play an important role in students' academic performance; each family can help the students to source the materials, ingredients, resources, or technology they need. Family income has a significant influence on students' academic achievement since schooling regularly needs financial allocation.

In the aspect of the parents' educational attainment, almost all parents attended formal schooling; however, few of them successfully graduated or earned a degree. As stated by Magnuson (2007), parents' educational and skill levels are factors in students' development and performance. According to Akan (2004), the educational attainment of parents influences students' learning outcomes and academic performance. When both parents are educated, there is a higher degree of supporting their children's academic activities and providing financial support. This implies that parents' educational attainment is a significant factor in the child's education.

Likewise, the respondents' families are quite small, enabling the provision of economic stability can be easily provided. In the study of Barry as cited by Martinete (2004), a student from a smaller family has a higher possibility of higher academic performance since the parents can more easily provide parental attention, academic support, and other resources compared to a larger family.

The socio-economic profiles of the fourth-year high school student respondents are shown in Table 1.

**Table 1: Frequency and percentage distribution of respondents' socio-demographic profiles**

Variables	Frequency (N=92)	Percentage (%)
Age		
15 years old	33	36
16 years old	43	47
17 years old	15	16
18 years old	1	1
Gender		
Male	56	61
Female	36	39
Family monthly income		
Php10,000 and less	0	0
Php10,001 – Php20,000	42	46
Php20,001 – Php30,000	30	32
Php30,001 and above	20	22
Mother's educational attainment		
Elementary level	1	1
Elementary graduate	15	16
High school level	11	12
High school graduate	12	13
College level	23	25
College graduate	27	30
Postgraduate level/graduate	3	3
Father's educational attainment		
Elementary level	4	4
Elementary graduate	21	23
High school level	8	9
High school graduate	10	11
College level	20	22
College graduate	27	29
Postgraduate level/graduate	2	2
Family Size		
1 – 4 members	74	80
5 – 8 members	18	20
<b>TOTAL</b>	<b>92</b>	<b>100%</b>

### 3.2. Students' Academic Performance in TLE

The level of achievement of students when they were exposed to simulation and conventional approaches was determined by the result of the pre-test and post-test. Table 2 shows the results of the academic improvement of the experimental group compared to those of the control group. As shown in Table 2, during the pre-test both groups' academic performance falls into the average category with 71% from the simulation group and 64% from the conventional group, with neither group reaching the very successful level. However, the academic performance of the simulation

group exceeds exponentially in the post-test compared to that of the conventional group. As shown in Table 2, 89% of them belong to a fairly successful category, while there are 0% in the conventional group. Although there are a number of students in the conventional group who have improved in their test scores, there are still 28% who failed the test, and the majority have an average score of 30. This suggests that there are still a few students who are proficient in their knowledge and skills in TLE.

**Table 2: Academic performance of students in TLE**

SCORE	DESCRIPTIVE RATING	SIMULATION GROUP				CONVENTION GROUP			
		PRE-TEST		POST-TEST		PRE-TEST		POST-TEST	
		N	%	N	%	N	%	N	%
50 – 60	Very successful	0	0	0	0	0	0	0	0
40 – 49	Fairly successful	9	20	40	89	0	0	0	0
30 – 39	Average	32	71	5	11	30	64	34	72
20 – 29	Not very successful	4	9	0	0	17	36	13	28
≥19	Failure	0	0	0	0	0	0	0	0
<b>TOTAL</b>		45	100%	45	100%	47	100%	47	100%

Legend:

Rating Scale	Descriptive rating	Qualitative Interpretation
50-60	Very successful	Very highly proficient in the knowledge and skills in TLE
40-49	Fairly successful	Highly proficient in the knowledge and skills in TLE
30-39	Average	Moderately proficient in the knowledge and skills in TLE
20-29	Not very successful	Slightly proficient in the knowledge and skills in TLE
≥19	Failure	Not proficient in the knowledge and skills in TLE

### 3.3. Attitudes towards TLE subject

Table 3 shows the students' attitude towards TLE. Students in both groups showed a positive attitude towards the subject. Moreover, an overall mean of 4.26 was obtained in the simulation group while an overall mean of 4.09 was obtained in the conventional group. This implies that the students like and are interested in learning TLE. Also, students in the simulation group display more interest in TLE compared to students in the conventional group. This is supported by Greenblat as cited by Shaw (2010), namely that simulation can enhance student motivation and interest in the issue area, the course, and learning in general. Likewise, real-life and hands-on experience in doing things enhances students' interest to learn and they become more active and engaging in the activities provided in the lesson. Students gain meaningful and in-depth learning once they experience and apply what they learn compared to just hearing and seeing the activities (Orlich et al., 2012).

According to Bransford et al. (2000), students' attitudes to learn vary depending on how the teacher presents the lesson. Students will become motivated to learn and develop a positive attitude to learn when they are able to apply the concepts in their daily activities and see the usefulness of what they have learned in class. Authentic learning is a more effective way of motivating students to learn and perform better in school. Real-world simulation as an authentic process encourages students to learn and develop their skills and attitudes towards learning.

**Table 3: Attitude of students towards TLE**

INDICATORS	SIMULATION		CONVENTIONAL	
	MEAN	QUALITATIVE DESCRIPTION	MEAN	QUALITATIVE DESCRIPTION
1. TLE is an interesting subject.	4.62	Highly positive	4.53	Highly positive
2. I try my best to improve my grade in TLE.	4.84	Highly positive	4.55	Highly positive
3. I enjoy my TLE class.	4.78	Highly positive	4.66	Highly positive
4. My TLE class is not boring.	4.00	Positive	3.96	Positive
5. I try hard to learn in my TLE class.	3.24	Moderately positive	3.28	Moderately positive
6. I don't find it difficult to understand TLE.	3.56	Positive	3.51	Positive
7. It is not okay with me if I don't know much in my TLE subject.	3.91	Positive	3.87	Positive
8. I am willing to learn the lessons in TLE subject.	4.76	Highly positive	4.72	Highly positive
9. I need to improve my TLE to finish my high school.	4.84	Highly positive	4.68	Highly positive
10. I like to listen to my teacher during TLE subject.				Highly positive
11. I learn interesting topics in my TLE class.	4.87	Highly positive	4.60	Positive
12. TLE is not a difficult subject.	4.67	Highly positive	4.38	Moderately positive
13. Most of the wings we do in TLE are not a waste of time.	3.92	Positive	3.26	Positive
14. I like the TLE subject.	4.00	Positive	3.91	Positive
15. I believe TLE is an important subject.	3.96	Positive	3.83	Highly positive
16. It is not hard to learn TLE.	4.98	Highly positive	4.60	Positive
17. TLE is one of my favorite subjects.	3.63	Positive	3.60	Highly positive
18. I do not find doing TLE laboratory exercises difficult.	4.64	Highly positive	4.60	Moderately positive
19. Learning TLE is very important.	2.98	Moderately positive	2.83	Highly positive
20. I do not feel sleepy during TLE classes.	4.93	Highly positive	4.60	Positive
	4.00	Positive	3.83	
Overall Mean	4.26	Positive	4.09	Positive

Legend

Scale	Range	Descriptive rating	Qualitative Interpretation
5	4.51 – 5.00	Strongly Agree	Highly positive attitude has been displayed towards TLE subject
4	3.51 – 4.50	Agree	Positive attitude has been displayed towards TLE subject.
3	2.51 – 3.50	Undecided	Moderately positive attitude has been displayed towards TLE subject.
2	1.51 – 2.50	Disagree	Negatively positive attitude has been displayed towards TLE subject.
1	1.00 – 1.50	Strongly disagree	Highly negative positive attitude has been displayed towards TLE subject.

### 3.4. Comparison between Pre-test and Post-Test of Simulation and Conventional Approaches as measured by T-test

As shown in Table 4, the simulation group showed a significant difference in their academic performance ( $t_{com} = .000 < t_{\alpha} = 0.05$ ) while no significant difference was observed in the conventional group. This implies that when exposing students to actual activities, which in this case is cooking, students will significantly improve in their academic performance compared to

students who were only exposed to a conventional teaching method. This is probably because conventional teaching is more teacher-centered whereas simulation is student-centered. As Uwameiye and Ojikutu (2008) pointed out, teaching must adopt a learner-centered approach. The teacher should design different teaching strategies that cater for students' needs and individual differences, providing them with a learning environment that is student friendly, thereby inviting students to be more participative rather than making students passive in the class. A learner-centered approach helps students shape their own learning experiences and develop their cognitive skills.

Simulation as a teaching strategy allows students to become more active, creative, and skillful. Providing experiential activities in teaching the lessons promotes students' abilities, conceptual understanding, and multiple intelligence. This will also enhance students' knowledge retention since they directly apply the concepts they learn in the lesson into reality through hands-on activities (Orlich et al., 2012).

**Table 4: T-test analysis of pre-test and post-test comparing the performance of students in the simulation and conventional groups**

VARIABLES	MEAN	VARIANCE	P(T<=t)	SIG.
Simulation (experimental)				
Pre – test	36.51	16.39		
Post – test	42.24	6.19	0.000	Sig.**
Conventional (control)				
Pre – test	30.83	7.19	0.303	Not sig.
Post – test	31.40	7.25		

\*\*t – test is significant at the .01 level (one – tailed)

### 3.5. Comparison between Students' Academic Performance when exposed to Simulation and Conventional Approaches

A comparison of students' performance whether exposed to simulation or conventional teaching approaches showed a significant difference as shown in Table 5. The academic performances of students taught using TLE lessons with cooking simulation were much higher compared to those of students who were taught using a conventional approach, that is, without actual cooking activities. The findings of the study are supported by Greenblat (in Shaw, 2010), namely that simulations can improve cognitive and affective learning. Students learn and perform better by being exposed to real-life activities rather than the conventional way of teaching using a textbook and discussion approach alone (Lane and Tang, 2000). Students who were exposed to actual activities, not only in cooking but also in handicrafts, household arts and management, have higher retention rates than students who were merely exposed to a traditional lecture-type of lesson in the classroom.

Active learning or simulation activities (e.g., hands-on activities, role playing, group projects, peer-led learning, and simulations) will not only improve students' academic performance but also help the instructor to teach the lesson effectively. Designing a lesson plan in teaching requires creativity and pedagogical knowledge skills of the teacher. In planning the lesson, the teacher must ensure that students' learning outcome is maximized and that they become independent learners in applying the concepts they learn from the lessons (Raines, 2003, p. 432). The teacher must be careful enough in designing the lesson and its content because there is some content that is not suited for teaching the higher orders of thinking such as "application, analysis, synthesis, or evaluation" (Bonwell, as quoted by Silvia, 2010, p. 398). Using simulation learning activities in the classroom has become a popular teaching technique in promoting the learners' interest and

engagement in the class (Silvia, 2012) and is a more effective teaching technique to facilitate the teaching-learning process with positive learning outcomes (Poling & Hupp, 2009).

**Table 5: Comparison of students' academic performance when exposed to two simulation and conventional teaching approaches**

	MEAN	VARIANCE	P(T<=t)	SIG.
Simulation	42.24	6.19	0.000	Sig **
Conventional	31.40	7.24		

*\*\*t-test is significant at the .01 level (one – tailed)*

### 3.6. Relationship between respondents' demographic profile, academic performance and attitudes towards TLE

**Table 6: Correlation among academic performance, socio-economic profile, and attitudes of students towards TLE**

VARIABLES	CORRELATION COEFFICIENT	PROBABILITY
Age	0.057	0.589 <sup>ns</sup>
Gender	-0.172	0.100 <sup>ns</sup>
Family monthly income	-0.036	0.736 <sup>ns</sup>
Mother's educational attainment	0.014	0.891 <sup>ns</sup>
Father's educational attainment	0.403	0.000**
Family size	0.264	0.011*
Attitude towards TLE	-0.185	0.077 <sup>ns</sup>

*\*\*Correlation is significant at the .01 level (2-tailed) \*Correlation is significant at the .05 (2-tailed) \*ns Not significant*

Data on Table 6 showed that attitude towards TLE and socio-economic profile in terms of age, gender, family monthly income, and mothers' educational attainment have correlation coefficients that are not significant at  $p < 0.05$  level. This means that these factors do not significantly influence academic performance of students in TLE. However, there is a significant relationship between academic performance, fathers' educational attainment ( $r = 0.403$ ,  $p < 0.000$ ) and family size ( $r = 0.264$ ,  $p < 0.011$ ). This means that fathers' educational level and family size have an impact on students' academic performance.

This is supported by the study of Ebunuwa-Okoh (2010) who examined the relationship among academic achievement, age, gender and the financial status of students. He learned that though age is considered as one of factors that may likely affect academic performance as it is associated with cognitive development and maturity, it does not significantly determine students' performance. The same is the case with gender and financial status. Gender influence on academic performance is inclusive (Buadi, as cited by Ebunuwa-Okoh, 2010). In terms of students' financial status, students' family incomes differ; nevertheless, these differences do not affect their academic performance. This means that regardless of income, students can perform equally in the class.

Despite much evidence that links maternal education as a predictor of academic performance (Azhar et al., 2013; Davis-Kean, 2005; Dubow et al., 2010), there is no concrete evidence that shows that the higher educational attainment of the mothers will improve the academic performance of their children. According to the researchers, there are mothers with low educational attainment whose children's academic performance is excellent.



Also, the result of this study revealed that attitude does not necessarily influence the academic performance of the student respondents. A possible reason for this is that students' attitude toward a subject is influenced by several factors. These factors, according to Mohamed and Waheed (2011), can be categorized into three groups: Firstly, factors associated with themselves include students' self-efficacy, motivation, and experiences in high school. Secondly, factors associated with the school, teacher and teaching may include teaching materials, school and classroom environment, teaching styles, and topics. Lastly, factors from the home environment such as parental expectations and involvement may also relate to students' attitude and consequently influence their performance towards the subject matter.

Likewise, correlation analysis also revealed that students' academic performance in TLE is significantly associated with their fathers' educational attainment. This contradicts the study of Zibihi and Pishghadam (2011), which indicated that mothers' educational level predicted students' performance; however, the fathers' educational level did not influence academic achievement. Also, a study by Philip (as quoted by Ogwen et al., 2014) found that parental education has an impact on student achievement; thus, students with both parents having a college education tended to achieve at the highest levels. Moreover, Davis-Kean (2010) stated that students whose parents have a tertiary level of education perform better in their academic activities, particularly in Science, Reading, and Mathematics, compared to the students whose parents had only had a basic education.

However, there is no irrefutable evidence showing that parental education influences the academic performance of the student in other subjects, especially in TLE and Home Economics. The finding of this study could be attributed to the fathers' role as the head of family. In most families, particularly in the Philippines, the fathers are not only expected to guide and their children; they are also the providers of the family and become one of the children's role models.

The result of this study agrees with the findings of Saleman et al. (2012), namely that family size impacts academic performance. The researcher concluded that large family size, in other words, having a large number of brothers and sisters negatively affects students' educational attainment. Seigal (in Muthoni, 2013) concurred that children from larger families have lower levels of education. Furthermore, a study conducted by Sigle et al. (2004) found that parents' support is not only limited to financial assistance, but most importantly, includes time, attention, and academic support of their children's education.

#### **4. Conclusion**

This study investigated the effects of a cooking-simulation approach on students' academic performance in TLE among fourth-year high school students of the MSU-Wao Community High School. The findings show that students from the simulation and conventional groups show positive attitudes toward TLE. However, the academic performance of the simulation group during the post-test significantly increases from a mean score of 36.51 to 42.24 compared to that of the conventional group whose mean score only shows a very minimal increase from 30.83 to 31.40. This implies that the simulation strategy in teaching TLE subjects significantly improved the students' academic performance in TLE.

Moreover, there was a significant relationship between students' academic performance, fathers' level of education, and family size. The conclusion can also be drawn that students will be much more interested in their subject and will achieve a better performance when an actual hands-on or simulation activity is introduced. Hence, a simulation approach in teaching an TLE lesson can be an effective, appropriate and acceptable method of improving the learning experience of students.

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