Contribution of Financial Mathematics and Linear Programming Courses and Gender to Financial Literacy

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Abstract- The financial product, service and system are getting more complex. Hence, the young generation will face a great challenge related to financial matters in the future. Financial Literacy (FL) must be an important part in mathematics, in particular, Financial Mathematics and Linear Programming Courses (FMLPC) for student of Undiksha Mathematics Education Study Program (UMESP). The goal of the study is to classify FL and determine FMLPC and gender contribution to FL. The study uses *ex post facto* design with the population is student of UMESP which studied FMLPC in 2018. Research sample uses random sampling technique. The technique and instrument to obtain data are questionnaire and documentation. The research uses descriptive method and regression analysis to study the data. Its result is: (1) in general, student of UMESP FL is medium. In detail, the percentages of UMESP students' FL level are: 12.5% (high), 82.5% (medium) and 5% (low); and (2) FMLPC and gender altogether, have no significant contribution to financial literacy. But, FMLPC significantly contributed to financial literacy. It is 5.70% and the relation is FL = 51,733 + 0,264 (FMLPC).

Keywords- Financial Literacy, Gender, Financial Mathematics and Linear Programming Courses

I. INTRODUCTION

Since the multi dimension crisis in 1998, most countries have established "financial education" programs. It is established for the young generation. The current financial product, service and system complexity will make them dealing with great "financial" related challenges. Jappelli (2010) stated Financial Literacy (FL) is not only important at individual level, influences household decision on investment and loan in financial market, but also in global level. It has consequences to overall economic stability. *Programme for International Student Assessment* (PISA) research on children, aged 15 in 18 countries in the world, showed, only 15% students are able to distinguish among needs and desires, make simple decision about daily expenses, recognize general financial purposes and apply numeric operation in an individual context. Another result, there is no difference in FL based on the gender, except in Italy, where male students have higher score than female students (OECD, 2014).

In 2016, Indonesia Financial Service Authority (OJK) surveyed 9680 respondents from 34 provinces and 64 regencies / cities. It showed that Indonesia FL Index is 29.66% and Bali FL Index is 37.45%. Only 36.02% of people claim to be able in calculating inflation and fine, interest, installment, investment result and product usage cost. Short term goal, like fulfilling daily needs and survival, dominated people financial goal (OJK, 2016).

In general, Bali applies patriarch system. It considers men superiority to women because they continue the clan (purusa). Olson & Defrain said (2003) patriarch culture shaped traditional gender behavior on people. In traditional gender role, men are regarded superior to women. In Pakistan, Farah Javed and Samreen Lodhi (2015) studied about gender related matters and found that gender had no role in financial decision making, but culture factor influenced on avoiding the risk behavior. Vincentius Andrew and Nanik Linawati (2014) study showed, demographic factors like sex, revenue level and financial knowledge have significant relations to Surabaya professionals' financial behavior. On the other hand, another demographic factor, education level, has no significant relations on Surabaya professionals' financial behavior. Chen and Volpe (Vincentius Andrew and Nanik Linawati; 2014) discovered, women has lower financial literacy than men.

Undiksha Mathematics Education Study Program (UMESP) alumni profiles are educators. Linear Program and Financial Mathematics are the only subjects related to Financial Literacy. The experience during education process will enrich teachers' experience and knowledge. In the long run, it will influence teacher performance. It needs to think about applying financial literacy as an education process component in UMESP. The problems are UMESP students' financial literacy (FL) level and FMLPC and Gender significant contribution to Financial Literacy (FL).

(Remund, 2010), OECD(2014) define FL as an ability to use knowledge and skill for managing financial or its resources and arrange both long and short term financial plans to improve economic condition. In line with the definition, FL has knowledge and application aspect. Huston (2010), Atkinson and Messy (2012) stated:

a. Knowledge dimension. It includes financial knowledge from education or experience related to personal financial product and concept.

b. Application dimension. It reflects ability and confidence to apply the knowledge efficiently.

According to OECD (2014), Financial Literacy Framework in PISA 2012 consists of content, process and context.

Content category; It consists of knowledge and comprehension which play important role in financial literacy. They are money and transaction, financial planning and management, risk and award, and financial landscape. **Process category**; It consists of financial information identification; information analysis in financial context, financial problem evaluation and financial knowledge, and understanding application. **Context category**; It covers education and occupation, home and family, individual and society.

Theoretically, gender is different from sex. Sex relates to biological sex difference. Gender is the sex role difference, based on cultural and social aspects, between men and women.

Gender prejudice on financial will affect financial literacy. (Lemaster,P and JoNell Strough, 2014) acquired, men are more tolerant to risk and more confidence in investment. More often than not, women communicate with their couple in investment decision making, but men hardly ever do it. The men confidence on investment is higher than women. Investment decision making consumes more time, tiresome and difficult job. Cautiousness and low risk tolerance level make women require more time to decide an investment.

II. RESEARCH METHOD

The dependent variable is FL, the independent variables are FMLPC and Gender. The population is UMESP students which studied FMLPC in 2018. The research uses Slovin's formula to determine research sampling size.

$n = N/(1+N\alpha^2)$,

n = sample size,

N = population size

α = significance level

The population is 99 (N = 99). Thus, using Slovin's formula, with α = 0,05, it got n = 79.35872, rounded to 80. Then, random sampling technique determined the sample. The study used documentary and questionnaire method to collect data. It applied documentary method to obtain FMLPC value data and questionnaire to determine gender and Financial Literacy. Financial Literacy questionnaire is based on PISA instrument (OECD, 2014)

The FL data is descriptive. Next, there are three classifications: high, medium and low. The conversion is as follow:

Average Score ≥ 80% = High

If ≤ 60% of average Score < 80% = Medium

Average Score < 60% = Low

(Haşmet Sarıgül, 2014)

The research applies regression analysis to determine FMLPC and gender contribution to Financial Literacy (FL).

III. RESULT AND DISCUSSION

A. Result of Research

Research samples characters are: females (66.25%), aged 18-20 years and the parents education background is senior high school (43.75%) and students with living cost less than 2 million (92.5%). The questioannaire consists of 13 statements. It has general gradation : strongly disagree, disagree, agree and strongly agree. The score for positive stem = 1, disagree = 2, strongly agree = 4. It reverses the scoring method if the stem is negative.Consequently, the FL maximum score is 13 x 4 = 52.

The study applied documentation technique to obtain FMLPC score (Resource: UPT TIK). All the scores, financial literacy and FMLPC point is changed into a 1 – 100 scales. The table below displays the result concisely.

TABLE I.   FINANCIAL LITERACY CLASSIFICATION

Literacy	Average	High	Medium	Low
Financial Literacy	72.12	12.5%	82.5%	5%

Table 1 shows, average financial literacy score is 72.12. It means the FL is medium. Specifically, financial literacy levels of UMESP students are: low 5%, medium 82.5%, and high 12.5%.

FMLPC and gender contribution to financial literacy formulates zero hypotheses as follow:

a. Ho: FMLPC and gender contribute to FL.

Ho is rejected if sig. F < 0. 05

b. Ho : FMLPC contributes to FL

Ho is rejected if sig. for FMLPC < 0.05

c. Ho : gender contributes to FL

Ho is rejected if sig. for gender < 0.05

Table 2, Table 3, and Table 4 show regression analysis output.

TABLE II.   REGRESSION ANALYSIS SUMMARY

Summary Model				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.305[a]	0.093	0.070	6.44588

a. Predictors: (Constant), GENDER (Z3), FMLPC (X1)

TABLE III.   ANOVA REGRESSION ANALYSIS (ANAREG)

ANOVA[a]					
Model	Sum of Squares	Df	Mean Square	F	Sig.
1 Regression	329.146	2	164.573	3.961	0.023[b]
Residual	3199.306	77	41.549		
Total	3528.452	79			

a. Dependent Variable: FIN. LITERACY (Z1)
b. Predictors: (Constant), GENDER (Z3), FMLPC (X1)

TABLE IV.   REGRESSION COEFFICIENT

Coefficients[a]					
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	51.110	9.319		5.484	0.000
FMLPC (X1)	0.260	0.120	0.235	2.164	0.034
GENDER (Z3)	2.685	1.524	0.191	1.762	0.082

a. Dependent Variable: FIN. LITERACY (Z1)

ANOVA Table shows sig. score is 0.023 which is lower than 0.05. It means that Ho is rejected or F value is significant. R Square in Summary Table shows contribution level, 0.093 or 9%. Based on table 4, FMLPC sig. value (0,034) which is lower than 0.05. Therefore, Ho is rejected. Gender sig. score (0.082) is higher than 0.05. As a result, Ho is accepted. It means FMLPC contributed to FL significantly while gender has no contribution. Hence, the study re-analyzes the population excluding gender variable. The following table shows the result.

TABLE V.   REGRESSION ANALYSIS SUMMARY

Summary Model				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.238[a]	0.057	0.045	6.53220

a. Predictors: (Constant), FMLPC (X1)

TABLE VI.   REGRESSION COEFFICIENT

Coefficients[a]					
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	51.733	9.437		5.482	0.000
FMLPC(X1)	0.264	0.122	0.238	2.166	0.033

a. Dependent Variable: FL (Z1)

It reject Ho because sig. FMLPC value (0,033) is lower than 0.05. It indicates significant contribution of FMLPC to FL (5.70%) and other variables. Therefore, the regression equation is:

$$FL = 51,733 + 0,264 \ (FMLPC)$$

It shows, if FMLPC increases 1 point, it may contribute 51.997% to FL.

B. Discussion

The study shows FMLPC contributes to FL and gender doesn't. In FMLPC, students are expected to have ability in comprehending linier program and financial mathematics concept. Furthermore, they can apply them to solve daily basis problem. The FMLPC students have to figure out basic competences. They include comprehension of: (1) simple interest concept, (2) compound interest concept, (3) annuity concept, (4) sinking fund and amortization concept (5) Linier program basic idea and model construction, (6) graphic method to solve linier program problem and (7) Simplex method to solve linier program problem. FMLPC material, especially in point 1- 4, is related to FL content. They are about money and transaction, financial management and planning, award and risk and also financial landscape. Financial landscape is information about transaction features, interest fluctuation, etc.

Gender has no contribution to FL. It means female and male students' financial literacy is equal. The result abandons Vincentius Andrew and Nanik Linawati (2014) discoveries. They observed that demographic factors (sex, revenue level and financial knowledge) have significant relation on financial behavior. Chen and Volpe (Vincentius Andrew and Nanik Linawati; 2014) showed that, generally, women financial literacy is lower than men.

Most UMESP students are from Bali. Balinese follow patriarch system. It is a system which considers that boys are superior to girls because they continue the clan. Balinese tend to have 2 children; they have "pade ngelahan" marriage system and have improved their education level. It begins to remove gender bias or patriarch system. Both boys and girls are treated equally. Suharta and Suarjana (2018) research supported the result. They revealed that parents education level influenced gender. There is no living cost difference between male and female students. The result reinforced Farah Javed and Samreen Lodhi (2015) research in Pakistan. It revealed that gender has no influence in financial decision making, but, cultural factor played an important role to avoid risk.

Research samples are dominated by women (66.25%). Female students' ability is relatively better than male students. Female students' attention, behavior, attitude, willingness and ability tend to be positive. It also happened in FMLPC, their ability was fairly better than male students.

IV.   CONCLUSION

The previous description constructs the conclusion. They are:

a.   UMESP students have medium financial literacy average. In detail, 12.5 % students are high, 82.5% medium and 5% low.

b.   FMLPC and gender have no significant contribution to financial literacy if they came as one. However, FMLPC contributed to financial literacy (5.70%). The relation is:

$$FL = 51,733 + 0,264 \ (FMLPC)$$

c. FMLPC needs restructuration to contribute better to financial literacy.

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