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INNOVATIVE LEARNING: Gender Perception Of E-Module Linear Equations In Mathematics And Physics

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Abstract

This research was conducted to answer students' perceptions based on gender towards the E-Module Mathematics Physics I on linear equations. This methodology uses quantitative research which is analyzed using statistical and inferential analysis techniques with a sample of 120 students. After testing, the results showed that the perceptions of male students and female students' perceptions were concluded that the average value of female students' perceptions had differences. From the difference in the average value of student perceptions based on gender in the research sample, it shows that the perception of students with male gender is higher than the average value of female gender perception because male students tend to have critical thinking skills towards material. related to mathematics compared to female students.

Keywords: Inovative Learning, Gender, Perception, Physics Education, E-Module

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1. Introduction

Education is the main pillar of the progress of a nation. Education can be understood as a set of practices that have the function of educating and directing others which can be described as a continuous process of achievement (Edwards, 2009; (Edwards, Ivanič, and Mannion 2009) Veiga-Neto & Lopes, 2017; Coles & Howard, 2018). Education is a key example of how technological developments began to shape and define today's social practices that are designed from the child's perspective and then implemented in the school system (Reader and Freathy 2016; Mayer 2018). Education is currently at a critical crossroads when in fact education can fulfill many goals, one of which is to equip the younger generation with comprehensive and academically oriented knowledge as a basis for further (higher) education (Woessmann 2016; Roosmaa, Martma, and Saar 2019). One way to improve the quality of education is to utilize technological advances.

Technology is defined as digital hardware and software, devices and programs related to or utilizing computing and data without being limited to usable devices (Finkel 2017; Bice et al. 2019). The rapid technological development makes humans live side by side with technology.With the development of technology whose realization is increasingly rapid, it is necessary to use mobile internet as one of the innovations of technological progress (Dalkılıç et al., 2017; Xu et al., 2018; Stojanović et al., 2020). Technology as a subject provides opportunities for students to learn, among others 'sol-

ving problems in creative, authentically embedded ways by combining thoughts and actions that link abstract concepts to concrete understandings, and evaluating products that can influence experiences (Wattchow and Brown 2011). With the advancement of technology, it is expected to produce the latest innovations in education that can improve the quality of education.

Educational innovations in the implementation of good learning can be applied to interactive learning media as additional media in teaching and learning activities (Nurrita 2019; Sopacua, Fadli, and Rochmat 2020; Tarigan and Siagian 2015). One of the innovations that can facilitate the interactive learning process is to apply learning in the form of E-Learning. E-learning is the information technology (IT) sector that utilizes the internet using tools such as WorldWideWeb, email and ftp to distribute online multimedia educational content via technology platforms generally considered to involve the delivery of computer applications of part or all of the modules for training in institutions or organizations (Moore, Dickson-Deane, and Galyen 2011; Olasina 2019). In education reform E-learning has become an important trend because it offers more natural interaction opportunities (Sundaygara,, 2019). In addition to the existence of e-learning as a form of technology utilization, another form of technology utilization in education is E-modules which function as learning media.

E-Modules are teaching materials that are contained in electronic form. The learning module contains materials, methods, and evaluations that are systematically designed to support the successful implementation of the learning process (Taufiqy et al., 2016; Sopacua et al., 2020). The preparation of modules has an important role in learning physics because it can accelerate the dissemination of information, improve students' literacy skills by having advantages compared to print media (Sundaygara et al., 2019; Darmaji, Kurniawan, Astalini, Kurniawan, et al., 2019; Gems & Mustadi, 2020). For teaching to be more effective a teacher must provide learning modules that meet all student learning needs by incorporating peer evaluation to encourage open communication and improve the learning process which has an impact on improving student performance (Fauzan,2020; Matsun, 2018). In this study, the E-module was designed in the form of a flipbook using the Flip PDF Professional application.

Perception is a process of conveying information into the human brain which aims to determine satisfaction regarding a positive point of view (Winarsunu, 2017). Students' perceptions are used in determining their satisfaction with e-learning courses (Howland & Moore, 2002; Martens et al., 2007; Martín-Rodríguez et al., 2015). Perception is a student process of interpreting, evaluating, receiving, giving opinions, and testing the data and sensory responses which are the basis for implementing modifications and thus optimizing the educational environment because it affects the effectiveness of teaching and learning (Chen & Wang, 2018; Goodlad et al., 2018; Darmaji, Kurniawan, Astalini, & Nasih, 2019). Therefore, it is necessary to assess students' perceptions of the E-module based on the flipbook maker in the Mathematics Physics I course with Linear equation material.

Linear equation material is one of the materials that must be mastered in mathematics physics courses studied by physics education students in semester 3 to semester 5. Based on research conducted by (Ayu et al. 2017) low student learning motivation is caused by a lack of student unders-

tanding of the material and problems given. Therefore, a solution is needed to generate interest and motivation in student learning in Mathematics Physics learning by making an ajae material in the form of an E-module so that students can study independently, interactive learning, so that learning becomes more interesting (Yusuf et al, 2020). Therefore, it is necessary for students' perceptions of e-modules as a measure of effectiveness during the process as teaching materials. So the researchers conducted this study to answer the following questions;

1. How are students' perceptions of the Mathematics and Physics E-Module in grades Class A, Class B and Class C?
2. What is the perception of students based on female gender towards the E-module Mathematics Physics Class A, Class B and Class C?

2. Method

a. Types of Research

This research uses quantitative research. Quantitative research has the advantage that the research subject to be studied is considered an objective reality, meaning that it is seen as subjective because it is a number-based research and data analysis uses statistical data. (Tavakol & Sandars, 2014; Winarsunu, 2017). Quantitative research reports are very fast in their development, this research is usually organized around four parts: Introduction, Methods, Results, and Discussion (Simpson & Lord, 2015; Hodis & Hancock, 2016). Quantitative analysis is used because it can represent a class that carries out many analytical approaches into a certain type of analysis (Ross and Onwuegbuzie 2014). Quantitative data from this study were obtained from a questionnaire.

b. Participants

The population is the whole object of people who have certain characteristics determined by the researcher to be studied and drawn conclusions while the number of samples is the total population (Great, 2011; I Wayan et al., 2014; Seika Ayuni et al., 2017; Zedko et al., 2017; Krismasari Dewi et al., 2019). The research sample was taken using a total sampling technique, where all samples came from the entire population (Edwan, Sutisyana, and Ilahi 2017). The research sample is physics education students class 2019 in class A, Class B and Class C. The number of samples in this study was 120 students with a ratio of the number of female and male students in class A as many as 22 male students and 18 female students. Meanwhile, the number of female and male students in class B is 17 male students and 17 female students. And the number of female and male students in class C is 15 male students and 25 female students.

c. Data Collection Instruments

Questionnaire is a method of collecting data by collecting data by sending a list of questions or statements to research subjects or research samples (Great, 2014; Sustainable, 2020). Questionnaires are often used in data collection methods, inIrwansyah et al., (2017) The number of questions in the questionnaire is 15 items with assessment indicators in the form of display of teaching materials, presentation of material in teaching materials and the usefulness of E-Modules.The questionnaire used by the researcher used a Likert scale approach. This Likert scale is often used as a rating scale, because it provides different values or scores, for example Strongly Agree (SS) = 5, Agree (S) = 4, Disagree (KS) = 3, Disagree (TS) = 2 , and Strongly Disagree (STS) = 1(Syofian & Setianingsih, 2015;

Pranatawijaya, V.H, 2019). In this study, a questionnaire was used to determine the feasibility of the e-module (Siyoto 2015).

Table 1. e-Module Assessment Indicator Grid

Assessment Indicators	Rated aspect	Declaration Number
E-Module Display	Text clarity	1
	Multimedia size suitability	2
	The clarity of the color and shape of the image	3
	Good multimedia display quality	4
	Multimedia that is presented is attractive	5
Presentation of Material in the e-Module	The material is easy to understand	6
	The order of the material is clear	7
	The sentences used are simple and easy to understand	8
	The language used is communicative	9
	Sample suitability with material	10
	The suitability of multimedia with the material	11
Benefits of the e-Module	Ease of use of modules	12
	Media can help students understand the material	13
	Interest in using modules	14
	Increased motivation to learn	15

The interval in the klasifikaisi for student perception score to E-module Physics Mathematics I is as follows

Table 2. Student Perception Score Classification

Interval	Category	Code
15.00-26.25	Not Very Good	NVG
26.26-37.50	Not Good	NG
37.51-48.75	Good	G
48.76-60.00	Very Good	VG

d. Data Analysis Techniques

The data analysis technique used is descriptive and inferential data analysis techniques. In the analysis of the data description, the data will be tested using the Assumption Test of the Normality test and Homogeneity Test which aims to determine the mean, standard deviation, variance and determine the category/classification, while for the statistical inferential test the data will be tested using the T test to see a comparison of students' perceptions of E. -module. There are several requirements that must be met and proven, namely: (1) the data analyzed must be normally distributed, (2) know that the data analyzed is homogeneous. Data processing using SPSS 23 Professional. Data analysis techniques include assumption test (normality test and homogeneity test) and ANOVA test.

Research with descriptive type is a research method that seeks to describe and interpret objects as they are. which aims to explain a situation or event according to field facts, meaning what it is about something related to variables (Zellatifanny and Mudjiyanto 2018). The data analysis technique includes the assumption test that is a requirement for the anova hytopesis test, the normality test and the homogenity test.

1. Assumption Test

The assumption test used as a prerequisite for the ANOVA test is normality and homogeneity tests (Sembiring 2019).

a. Normality test.

The normality test used is the Kolmogorov Smirnov test. The decision-making guideline is if the significance value is > 0.05 then the data is said to be normal. aims to see that the data is normally distributed by taking into account the significance value.

b. Homogeneity Test

The homogeneity test used by Levene's Test for Equality of Variance on SPSS software with the test criteria used was sig > with a level of = 0.05. it aims to examine the level of homogeneity with the assumption of homogeneous data2. Hypothesis Test.

c. Anova test

One Way ANOVA analysis or ANOVA test aims to compare the average values contained in the dependent variable in all groups being compared. Basis for decision making ANOVA test. If the significance value (sig) < 0.05 then the average is different.

3. Result and Discussion

There has been a discussion about research to measure student perceptions of E-modules as teaching materials. The update of this research is regarding the material contained in the E-Module, namely Mathematics Physics I material on Linear equations, the use of flipbook software using Flip PDF Professional and different samples and populations, namely Jambi University Physics education students who have contracted Mathematics Physics courses. I. The picture of the research can be seen from the picture below.

Figure 1. E-Module Cover Display

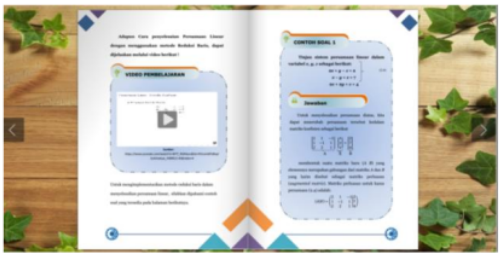

Figure 2. Display of the learning page

After the E-Module was designed and declared feasible for distribution, the researchers then conducted research by distributing questionnaires regarding student perceptions, then examined using descriptive statistics, the following results were found.

Table 3. Descriptive Test Based on Gender In Class A

Class A	Interval	F	(%)	Categories	Mean	Median	Mode	Max	Min
Boys	15.00 – 26.25	0	0%	NVG	46.83	47.00	45.00	54.00	43.00
	26.25 – 37.50	0	0%	NG					
	37.51 – 48.75	14	77.8%	G					

Class A	Interval	F	(%)	Categories	Mean	Median	Mode	Max	Min
Girls	48.76 – 60.00	4	22.2%	VG	52.48	52.00	53.00	58.00	45.00
	15.00 – 26.25	0	0%	NVG					
	26.25 – 37.50	0	0%	NG					
	37.51 – 48.75	7	31.8%	G					
	48.76 – 60.00	15	68.2%	VG					

Based on table 3 using a descriptive test based on gender in class A, it is known that for the male gender, 77.8% of male students have a good perception of the E-module, and 22.2% of male students have a good perception of the E-module. very good perception. against E-modules. With an average value of 46.83, the mean value of 47.00, the mode data is 45.00 with the highest value of 54.00 and the lowest value of 43.00. Meanwhile in class A, which is female, 31.8% of students have a good perception of the E-module, and 62.2% of female students have a very good perception of the E-module. With an average value of 52.48, an average value of 52.00, mode data 53.00 with the highest value of 58.00 and the lowest value of 45.00.

Table 4. Descriptive Test Based on Gender in Class B

Class B	Interval	F	(%)	Categories	Mean	Median	Mode	Max	Min
Boys	15.00 – 26.25	0	0%	NVG	50.62	52.00	48.00	59.00	46.00
	26.25 – 37.50	0	0%	NG					
	37.51 – 48.75	6	35.3%	G					
	48.76 – 60.00	11	64.7%	VG					
Girls	15.00 – 26.25	0	0%	NVG	50.72	50.00	54.00	59.00	44.00
	26.25 – 37.50	0	0%	NG					
	37.51 – 48.75	7	30.4%	G					
	48.76 – 60.00	16	69.6%	VG					

Based on table 4 using a descriptive test based on gender in class B it is known that the formal gender obtained by male students is 35.3% male students who have a good perception of the E-module, and 64.7% male students. man. students have very good perception about E-module. With an average value of 50.62, the middle value of 52.00, the data mode of 48.00 with the highest value of 59.00 and the lowest value of 46.00. Meanwhile, for female class B students, 30.4% of students have a good perception of the E-module, and 69.6% of female students have a very good perception of the E-module. With an average value of 50.72, an average value of 50.00, mode data 54.00 with the highest value of 59.00 and the lowest value of 44.00.

Table 5. Descriptive Test Based on Gender in Class

Class C	Interval	F	(%)	Categories	Mean	Median	Mode	Max	Min
Boys	15.00 – 26.25	0	0%	NVG	48.32	49.00	45.00	59.00	42.00
	26.25 – 37.50	0	0%	NG					
	37.51 – 48.75	8	53.3%	G					
	48.76 – 60.00	7	46.7%	VG					
Girls	15.00 – 26.25	0	0%	NVG	46.72	48.00	48.00	56.00	42.00
	26.25 – 37.50	0	0%	NG					
	37.51 – 48.75	17	68.0%	G					
	48.76 – 60.00	8	32.0%	VG					

Based on table 5 using a descriptive test based on gender in class C, it is known that for the male gender, 53.3% of male students have a good perception of the E-module, and 46.7% of male students have a good perception of the E-module. good thing about E-modules. E-module. very good. against E-modules. With an average value of 48.32, an average value of 49.00, mode data 45.00 with the highest value of 59.00 and the lowest value of 42.00. While for class C students, 68% of students have a good perception of the E-module, and as many as 32% of the students have a very good perception of the E-module. With an average value of 446.72, the middle value of 48.00, the data mode is 48.00 with the highest value of 56.00 and the lowest value of 42.00.

After testing using descriptive statistics, the data was further tested to determine the comparison of students' perceptions of the Mathematics Physics E-Module. There are several prerequisites for conducting further testing, namely by conducting a normality test and a homogeneity test.

Table 5. Normality Test and Homogeneity Test Boy Student

Normality Test Shapiro-Wilk				Test Of Homogeneity Of Variance			
Perception	Statistics	Df	Sig	Leavene Statistics	Df2	Df1	Sig
Boys Class A	0.756	18	0.054				
Boys Class B	0.89	17	0.742	0.656	2	47	0.654
Boys Class C	0.972	15	0.835				

Normality test is used to determine whether a data is in normal condition or not. The basis for decision making is taken if the sig value is greater than 0.05 then the research data is normally distributed. Based on the table above, for boys in class A, the value of sig is obtained. of 0.054 > 0.05, it can be said that the data is normally distributed, class B boys are found to have sig. of 0.742 > 0.05, it can be said that the data is normally distributed, class C male has a sig value. of 0.835 > 0.05, it can be said that the data is normally distributed. After knowing that the data is normally distributed, the homogeneity test will be carried out.

In statistical analysis, the homogeneity test aims to determine whether the variation in the data from the sample population has the same variation or not, the same as the normality test, the homogeneity test is also one of the prerequisites in comparative analysis such as the ANOVA test. Based on the table above for the homogeneity test, it shows that the sig is 0.654 then based on the prerequisites of the Anova test where if the sig value> 0.05 it can be taken a decision that the variance of two or more data population groups is the same (homogeneous).

Table 6. Normality Test and Homogeneity Test Girls Student

Normality test Kalmogrov-Smirnov				Test of Homogeneity of variance			
Perception	Statistics	df	sig	leavene statistics	df2	df1	sig
GirlsClass A	0.83	22	0.151				
GirlsClass B	0.763	23	0.151	0.856	2	67	0.548
GirlsClass C	0.201	25	0.151				

Then the normality test and homogeneity test were carried out. where the normality test used is the Kalmogrov-Smirnov normality test because the sample is larger

than > 50. The basis for making the decision on the Kalmogrov-Smirnov normality test if the sig value is greater than 0.05 then the research data is normally distributed. Based on the table above, for boys in grades A, B and C, sig. of 0.151 > 0.05, it can be said that the data is normally distributed. Furthermore, after it is known that the data is normally distributed, a homogeneity test will be carried out. The homogeneity test aims to determine whether the variation in the data from the sample population has the same variation or not. The table above for the homogeneity test shows that the sig is 0.548, so based on the prerequisites for the ANOVA test where if the sig value is > 0.05, it can be said that the variance of two or more groups of population data is the same (homogeneous). Then the data can then be tested using the Anova sample test.

Table 7. ANOVA test boys student

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	123,338	2	69.169	4.663	.032
Within Groups	657,452	47	14,834		
Total	765.520	49			

Table 7 is a statistical test using the one way ANOVA test to see the comparison of student perceptions by gender for the male gender in classes A, B and C. Based on the significance value (sig) for the male ANOVA test is 0.032 where the value is 0.032. significance (sig) 0.032 < 0.05, it is concluded that the average perception value of male students in grades A, B and C is different.

Table 8. ANOVA test girls Student

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	207,561	2	103,780	8,531	.0331
Within Groups	815,082	67	12.165		
Total	1022,643	69			

Furthermore, the One Way Anova test for female gender in classes A, B and C. Table 7 is a statistical test of the comparison of student perceptions of the E-Module based on female gender in classes A, B and C. Based on the significance value (sig) for the test ANOVA for female gender is 0.0331 where the significance value (sig) is 0.0331 <0.05, it is concluded that the average value of perceptions of students in grades A, B and C is different.

This research has an update from previous research, namely a more in-depth study of the relationship between student perceptions of the Mathematics Physics E-Module I which is associated with student gender in the linear equation material for the Mathematics Physics I course. This study focuses on how students' perceptions based on gender towards E-Module Mathematics Physics Module I. This research was conducted at the Physics Education Study Program, Jambi University with a pilot sample of all 2019 Jambi university education students.

To answer the questions in the study, the researcher first conducted a descriptive test of students' perceptions of students' E-Modules to see students' perceptions of E-modules which were in the good and very good categories. After doing a descriptive test by looking at the categories, the researcher then compared the average values.

By comparing the mean values based on descriptive statistical tests. The average perception scores of male students in grades A, B and C obtained an average score of 46.83, 50.62, 48.32, respectively. While the average value of the perception of students' gender is 52.48, 50.72, 46.72. the mean value serves to state the sample mean. With the average sample for the male gender is in the good and very good category, and the average value of the student's perception of the female gender is in the good and very good category. Therefore, researchers will conduct a more in-depth gender analysis.

To test the ANOVA test hypothesis. There are some prerequisites for testing the assumptions first. Which is an assumption test in the form of normality test and homogeneity test. After the data is confirmed to be normally distributed and homogeneous, then the data will be analyzed using the ANOVA test. After testing, the results obtained for the perceptions of male students in classes A, B and C obtained a significance value (sig) 0.324 where the significance value (sig) 032 < 0.05 then obtained a decision that the average value of male students' perceptions of class A, B and C are different. As for the perception of female students getting a significance value (sig) of 0.0331 <0.05, it is concluded that the average value of female students' perceptions of class A, B and C are different.

From the difference in the average value of student perceptions based on gender in class A, class B and class C, it shows that the perception of students with male gender is higher than the average value of female gender perception. This makes the researcher conduct an assessment through a literature study. The initial assumption about why men's perceptions are higher than women's is because male students tend to have the ability to think critically about mathematics-related material compared to female students. This assumption is reinforced by the existence of research conducted by(BS Anggoro, 2016) and (B. Cahyono, 2017) In his research, it was concluded that the high mathematical creative thinking disposition was found in male students. The level of critical thinking ability of students with male gender is due to the difference in treatment for men and women at home and at school. The difference in treatment between genders has a major influence on students' identity and academic development.

While female students have a lower average perception value than men, the first assumption is that women have a higher standard of assessment compared to the assessment standard of men. Another assumption is that female students tend to be more real in assessing the available E-modules, female students will be more focused on criticizing with higher standards than female students. This is reinforced by research conducted by (F. Feriyanto, 2018) and (U. Umaroh and H. Pujiastuti, 2020), with the results of the study that female subjects had good, complete and precise verbal, visual, and symbolic representation skills, so that the female gender had better representational abilities than men and was able to research and be good at drawing conclusions, but female students tend to have low self-esteem.

Education is one of the sectors affected by Covid 19 which makes learning less effective (Haiyudi and Art-In 2021). Regarding the development of teaching materials, currently the development of teaching materials in the form of modules is a very urgent need (W. Hartono and MS Noto, 2017). The need for IT-based teaching concepts and mechanisms and learning is inevitable (Pramita et al. 2021). We need to learn media in the form of teaching materials that can make it easier for students to

understand a learning material (Astalini et al. 2021). Learning media involving technology makes the teaching and learning process effective, especially during the Covid-19 pandemic (Hermita et al. 2022). Modules that are packaged electronically or commonly called e-learning modules are interesting and contextual (Ningsih , 2021). This is a solution to the facts on the ground found by (Darmawan and Suparman 2019) which states that the reality on the ground is not as expected, mathematics learning still tends to be textbook-oriented. By using this e-module, students are directed to learn independently in new knowledge by using pre-existing knowledge. Students learn independently without expecting all the material to be transferred by the course lecturer and find out the existing concepts by being guided by the designed modules.

Several similar studies were found that examined students' perceptions of digital electronic-based learning, this was explained by(Febro, Catindig, and Caparida 2020) that the digital gender gap is still a major challenge that needs to be addressed. in poor rural and urban populations in developing countries. Therefore, it is necessary to study students' perceptions of e-module teaching materials as learning media based on digital electronics. Meanwhile, students' perceptions of e-modules based on gender can be explained based on research conducted by (Nurramadhani, Lathifah, and Yamin 2021)Male students excel in the categories of understanding, relationship, and evaluation of female students, while female students are superior in information, findings & solutions than female students. Men. This is in accordance with the findings of researchers in this study where men have a higher level of creative thinking in solving problems so that men's perceptions of e-modules are higher.

In addition, another analysis was carried out on the factors that influence the presence of students who gave responses in the unfavorable category, after being reviewed, it turned out that there were several things that influenced the use of E-Modules, including Smartphones or learning hardware that were less supportive and networks or connections. Internet students who are experiencing problems hamper the maximum use of E-Modules. This is also supported by research conducted where the E-Modul download process requires internet quota (Ariani, Susanti, and Slamet 2021). Perception is a process of students interpreting, evaluating, receiving, giving opinions, and testing the data and sensory responses which are the basis for implementing modifications, besides that perception is also used as a critical dimension that determines student satisfaction. The importance of student perceptions is used as a reference for the suitability of teachers in providing teaching materials, as well as a more targeted educational assessment. the importance of research that examines students' perceptions because perception is an assessment process that starts from the use of the five senses in receiving a stimulus, then it is organized and interpreted so that it has an understanding of what is sensed. (Nugroho 2012). Therefore, it is necessary to assess students' perceptions of the E-module based on the flipbook maker in the Mathematics Physics I course with Linear equation material. So that it will provide an evaluation of the teacher to make the learning process more effective.

4. Conclusion

Based on the research conducted, it is concluded thatThe perception of men is higher than that of women because students with male gender tend to have the ability to think critically about mathematics-related

material compared to students with female gender, while another assumption is that female gender has verbal, visual, and symbolic representation abilities. properly, completely and accurately, so that the female gender has better representational abilities compared to men and is able to research and is good at drawing conclusions, but female students tend to have low levels of self-confidence.

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