

# EFFECTS OF FELDER-SILVERMAN AND HONEY-MUMFORD LEARNING MODEL ON STUDENTS' IN TECHNICAL COLLEGE

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## ABSTRACT

In Nigeria, enhancing instructional delivery in Radio, Television and Electronics (RTVE) as a trade subject in technical colleges has become a great concern for technical teachers as it focuses on overcoming the challenges of assisting the learner to learn by enhancing their cognitive achievement and interest. The purpose of this study was to determine the effect of Felder-Silverman and Honey-Mumford learning models on students' achievement and interest in RTVE. Two research questions and three hypotheses tested at .05 level of significance guided the study. The study adopted quasi-experimental design. The population for the study consisted of 60 National Technical Certificate level II (NTC II) RTVE students in Technical colleges in Nigeria Federal Capital Territory, Abuja. A population of 60 students consisting of 50 males and 10 females were assigned to two treatment groups. The instruments for data collection were Radio, Television and Electronics Achievement Test (RTVEAT) and Radio, Television and Electronics Interest Inventory (RTVEII). The RTVEAT and RTVEII; Felder-Silverman lesson plans and Honey-Mumford lesson plans were validation. The test-retest reliability was determined using Pearson Product Moment Correlation Coefficient and was found to be .91, while the internal consistency of the RTVEAT was determined by Kuder-Richardson 20 (KR20). The RTVEII was subjected to construct validation using principal component analysis. A total of 24 items were selected for the study in the interest inventory. The internal consistency estimate of the RTVEII was determined using Cronbach Alpha technique and was found to be .82. Mean was used to answer the research questions while, Analysis of Covariance (ANCOVA) was used to test the four hypotheses that guided the study at .05 level of probability. The study found out, among others, that Felder-Silverman learning model is more effective than Honey-Mumford learning model in improving students' achievement and interest in RTVE. There was an effect of gender on students' achievement and interest in favour of females. Gender had no significant effect on students' achievement. The study found no significant effect of treatments and gender on students' achievement and interest in RTVE. The study recommended among others that Felder-Silverman learning model should be adopted in the teaching/learning of RTVE in Technical Colleges. In addition, workshops, seminars and conferences should be organized by Federal and State Science and Technical Schools Board to enlighten and train RTVE teachers on the application of Felder-Silverman learning model for improving students' achievement and interest in studying RTVE.

**Keywords:** Felder-Silverman, Honey-Mumford Learning Model Achievement, Radio Television and Electronics Work, Technical College.

## INTRODUCTION

Radio, Television and Electronics Work (RTVE) is one of the programs offered in technical colleges in Nigeria. It comprises the following modules; Basic Electricity, Electronics Devices and Circuit, Radio Communication, Radio and Audio Frequency amplifiers, Satellite Transmissions and Reception, Television, Electrical & Electronic Drawing, Colour Television, Radio & Electronics system (National Board for Technical Education, NBTE 2007). RTVE works is designed to equip students with hands-on experience in installing, maintaining and servicing of electronic devices and systems (NBTE, 2007). After three decades of implementing the National Policy on Education (NPE), Nigeria is yet to fully enjoy the benefit of the technical education component of the policy of which RTVE work is one. However, as a result of the ever increasing change and development in Technology, RTVE work has

become complex. Television, radio and other electronic devices no longer have large component, they now come in Nano sizes which requires high skills to work on (Raymond, 2013).

This technological development in workplace and industry has necessitated the need to equip students of RTVE work with basic thinking skills which will make them adapt to the present and envisaged future change in this workplace and industry (Ogbuanya & Owodunni, 2015). The National Board for Technical Education (NBTE, 2007) maintained that RTVE craftsmen are expected to: understand basic principles of radio transmission and reception, basic skill on satellite transmission and reception, troubleshoot and repair faulty equipment, understand principles of amplifier and its operation, understand television, camera and closed circuit, electronic component and symbols and electrical component.

Therefore, for students to acquire the adequate skills needed, several factors ranging from the student, teacher, families and school need to be in place to prepare them in all areas of life challenges. However, several researchers and educators have found that one major factor affecting student achievement is learning style (Zhang, 2005; Bargu, 2013). Owodunni, (2010) in a study found that the poor achievement of student in RTVE work was as a result of the learning styles of the students not being considered in the process of teaching and learning of the course. Graf, Liu & Kinshuk (2010) also pointed that students' achievement could be improved if learning styles could be taken into consideration when developing any learning plan. Mutua (2015) also noted that there is a strong intuitive appeal in the idea that instructors, course designers and educational psychologists should pay closer attention to student learning styles by diagnosing them, by encouraging learners to reflect on them and by designing teaching and learning process around the learner's learning style. When this is done it will help reach more students because of better match between teacher and learner styles.

The research on learning styles has been active since four decades ago (Cassidy, 2004). There exist various definitions for learning styles. As referred by Campbell et al. (2003), learning styles is defined as a certain specified pattern of behaviour according to which the individual approaches learning experience. While Felder and Spurlin (2005) defined learning styles as the different ways students take in and process information. Another popular definition for learning styles refers to individuals' characteristics and preferred ways of gathering, organizing and thinking about information (Fleming, 2005). As noted by Kolb and Kolb (2005), learning styles are not fixed personality traits but rather one's adaptive orientation to learning. Felder and Spurlin (2005) shared similar view with Kolb by which they stressed that "learning style profiles suggest behavioural tendencies rather than being infallible predictors of behaviour". Many of the researchers did agree that individuals may tend to have a preference for one or two learning styles over others and the preferences can be affected by a student's educational experience (Felder & Spurlin, 2005). Throughout the learning process and based on different educational experience, the students may discover better way of learning and develop certain learning preferences, which will help in enhancing the academic achievement and interest on what is being taught.

Moreover, the problem does not only lie in just the teacher identifying the student learning styles in teaching and learning of any course including RTVE but proper matching. Graf and Kinshuk (2010) observed that a good match between students' learning style and teachers' teaching style has been demonstrated to have positive effect on students' achievement. Teaching styles also vary as much as learning style varies. Teachers have different strength and preference with regards to how they develop an individual's learning and learning styles (Suntonrapot, 2014). Some teachers give lectures, some demonstrate or discuss, while some focus on rules and others on example, some emphasize memory and other understanding. In view of this, Mehigan (2013) established that some students seem to learn better when information is presented through word (verbal learners), whereas others seem to learn better when it is presented in the form of picture (visual learners). This clearly shows in a class where only one learning style is employed, there is a strong possibility that a number of students will find the learning environment less optimal and this could affect their academic

achievement (Ibe, 2015). Furthermore, there are several learning styles but the study is considering the effect of Felder- Silverman learning style model and Honey-Mumford learning model on student achievement and interest in RTVE work. The two models seem appropriate for the study because of its ability to develop student achievement and also because RTVE work is considered to be an engineering course (NBTE, 2007).

Student achievement is seen as how successful the learner can master the materials of the learning object (Raymond, 2013). It is the extent to which a student, teacher or institution has achieved their educational goals. Student achievement is commonly measured by examinations or continuous assessment. Furthermore, the more the interest of the learner in any subject the better the student' achievement. Schraw et al (2001) state that interest is the attraction which forces or compels a learner to respond to a particular stimulus. Interest increases learning therefore promoting interest in the classroom increases student intrinsic motivation to learn. An engaged learning environment promotes student interest in learning, this means that when learners are involve in the learning process with rapid interest, learning is facilitated and achievement can be enhanced. Student interest in any learning activity can therefore be sustained by the active involvement of the learner in all aspect of the learning process. Obodo (2004) maintained that interest control the motivation to learn, thus it has a direct relationship with student achievement in any school subject. Therefore the study seeks to determine the effect of Felder-Silverman and Honey-Mumford learning model on student achievement and interest in RTVE.

### **STATEMENT OF THE PROBLEM**

The rapid rate of technology development in RTVE work and the increasing demands on cognitive skills in RTVE work calls for a change in the instructional delivery system used in training RTVE craftsmen in Technical Colleges. It is observed that most of the RTVE craftsmen graduating from Technical Colleges often find it difficult to adapt and apply their knowledge and skills to trace and rectify RTVE problems under varying technological situations. The learning method applied in training RTVE students in Technical Colleges do not give student enough opportunities to be fully involved in the learning process; this is because the teacher is seen as the fountain of knowledge, making the whole process a teacher- centred. This leads to difficulties in learning, disinterest and low academic achievement by the students. Not all students learn the same way; it become imperative that teachers realize the learning style differences and teach in a manner in which all learning style are incorporated to ensure that large number of student learn equally and effectively. However, several researches in the past has pointed to the high weakness in the conventional method in teaching and learning of engineering trade such a RTVE work in Technical Colleges. In this 21<sup>st</sup> century where technology advancement changes by the day, a more effect teaching and learning approach is required to match the present day challenge and also the future. More so, research has shown that teaching process rooted in Felder –Silverman learning model and Honey-Mumford learning model are capable of enhancing the learners' abilities and developing problem solving and higher order of thinking skills in the learner as well as improving interest in chemical engineering. Therefore a more reliable instructional delivery system is required to enhance RTVE craftsmen in Technical Colleges. Hence the need for the study is to determine the effects of Felder – Silverman and Honey- Mumford learning model on students' achievement as well as interest in studying RTVE in Technical Colleges in FCT?

### **AIM AND OBJECTIVE OF THE STUDY**

The study determined the effect of :

1. Felder-Silverman and Honey-Mumford learning models on student academic achievement in RTVE
2. Felder - Silverman and Honey-Mumford learning models on student interest in RTVE

### **RESEARCH QUESTIONS**

The following research questions are structured to guide the study

1. What is the effect of Felder –Silverman and Honey-Mumford learning models on students' academic achievement in RTVE?

2. What is the effect of Felder-Silverman and Honey–Mumford learning models on students' interest in RTVE?

## **HYPOTHESES**

The following null hypotheses guided the study

**HO<sub>1</sub>:** There is no significant difference between the effect of Felder-Silverman learning model (FSLM) and Honey-Mumford learning model (HMLM) on students' academic achievement in RTVE

**HO<sub>2</sub>:** There is no significant difference between the effect of Felder–Silverman learning model and Honey–Mumford learning models on students' interest in RTVE

## **METHODOLOGY**

The design of the study was quasi-experimental research design. The research made use of pre-test, post-test non-equivalent control group design. The researcher randomly assigned intact classes to treatment and control groups. This was necessary in order not to disrupt the normal classes of the students and the school time-table. The population of this study comprises 60 (50 male and 10 female) year II students of Radio, Television and Electronic works in the technical colleges that offered the course in FCT, Abuja. The entire population was used for the study. The instruments used for data collection were Radio, Television and Electronic Achievement Test (RTVEAT) and Radio, Television and Electronic Interest Inventory (RTVEII). Also Felder-Silverman Learning Inventory and Honey-Mumford Learning style inventory was used to identify the student learning style. To ensure content validity of the RTVEAT, a table of specification was built for the test. The Felder-Silverman and Honey-Mumford lesson plans, RTVEAT, RTVEII and the training manual were subjected to face validation by three experts. The RTVEAT was trial-tested to determine its psychometric indices and reliability coefficient. The trial test for determining the coefficient of stability of the RTVEAT was carried out using test re-test reliability technique. Pearson Product Moment Correlation coefficient of the RTVEAT was found to be 0.91 while the reliability of the RTVE Interest Inventory (RTVEII) was determined by computing the Cronbach Alpha internal consistency coefficient of the pilot test scores of the 24 item RTVEII which was found to be 0.82 The RTVEAT and RTVEII items were subjected to face and content validation by Electronic works Lecturers experts at University of Technology Minna, Nigeria. It entailed checking the RTVEAT and RTVEII items against the topic and content of the lesson plan.

The researcher prepared two (2) sets of lesson plans for the teaching of the module set out for the study. These lesson plans were prepared from the units in the test blue print. Each set contains eight (8) lesson plans that lasted for a period of eight weeks and 90minutes duration. One set of the lesson plan was written based on Felder- Silverman Learning Model, the subject teacher in the experimental group applied this lesson plan at different stages of instructional process, while the second set was prepared based on Honey-Mumford learning model in teaching the RTVE work students.

The research questions were analysed using the mean and Standard deviation while analysis of covariance (ANCOVA) was used to test the hypotheses at 0.05 level of significant. Since students in their intact classes (non-randomised groups) participate in the experiment, ANCOVA was considered appropriate for analysing the difference between the effects of the treatments on the dependent variable. The results that were obtained was analysed via version 20 SPSS. The F value and probability level (0.05) was used to make decision, hence any F value that is less than the probability value (p 0.05) was rejected and any F value that is greater than probability level (p 0.05) was accepted.

## **RESULTS**

**Research Question One:** What is the effect of Felder –Silverman and Honey-Mumford learning models on students' academic achievement in RTVE?

**Table 1: Pre-test and Post-test mean Scores of Treatment Groups Taught with Honey-Mumford and Felder-Silverman Learning Model in Radio, Television and Electronic Academic Achievement Test.**

| Group | N  | Pretest Scores<br>$\bar{X}$ | Posttest Scores<br>$\bar{X}$ | Mean Gain<br>$\bar{X}$ |
|-------|----|-----------------------------|------------------------------|------------------------|
| HMLM  | 25 | 5.56                        | 25.88                        | 20.22                  |
| FSLM  | 35 | 5.74                        | 26.86                        | 21.12                  |

N= Number of students,  $\bar{X}$ = Mean, HMLM=Honey– Mumford Learning Model, FSLM= Felder- Silverman Learning Model.

The result presented in Table 1 reveals that treatment group taught RTVE with HMLM had a mean score of 5.56 in the pre-test and a mean score of 25.88 in the post-test making a pre-test post-test Mean gain of 20.32. The treatment group taught RTVE with FSLM had a mean score of 5.74 in the pre-test and a post-test mean of 26.86, with a mean gain of 21.12. The analysis of the result shows that achievement scores of FSLM is higher than achievement score of student in HMLM; therefore FSLM is more effective in improving students' Academic achievement in RTVE.

**Research Question Two:** What is the effect of Felder-Silverman and Honey–Mumford learning models on students' interest in RTVE?

**Table 2: Pre-test and Post-test Interest Scores of students taught with Honey - Mumford Learning Model and Felder- Silverman Learning Model**

| Group | N  | Pretest<br>$\bar{X}$ | Posttest<br>$\bar{X}$ | Mean Gain<br>$\bar{X}$ |
|-------|----|----------------------|-----------------------|------------------------|
| HMLM  | 25 | 1.43                 | 2.99                  | 1.46                   |
| FSLM  | 35 | 1.49                 | 3.17                  | 1.68                   |

The result presented in Table 2 shows that interest inventory of RTVE student with HMLM had a mean score of 1.43 in the pre-test and a mean score of 2.99 in the post-test making a pre-test post-test mean gain of 1.46. The treatment group taught RTVE with FSLM had a mean score of 1.49 in the pre-test and a post-test mean of 3.17, with a mean gain of 1.68. The analysis of the result shows that both HMLM and FSLM are effective in improving students' interest in RTVE, but FSLM is more effective in improving students' interest in RTVE than the HMLM.

### Hypotheses Testing

**H<sub>01</sub>:** There is no significant differences between the academic achievements mean score of student with Felder–Silverman and Honey–Mumford learning models.

**Table 3: Summary of ANCOVA of Academic achievement Score of Student Taught RTVE with Felder-Silverman Learning Model and Honey-Mumford Learning Model**

| Source           | Type III Sum of Squares | Df | Mean Square | F       | Sig. |
|------------------|-------------------------|----|-------------|---------|------|
| Corrected Model  | 163.796 <sup>a</sup>    | 4  | 40.949      | 1.218   | .314 |
| Intercept        | 4025.143                | 1  | 4025.143    | 119.728 | .000 |
| Gender           | 119.909                 | 1  | 119.909     | 3.567   | .000 |
| Treatment        | 8.266                   | 1  | 8.266       | .246    | .000 |
| Treatment*Gender | 1.741                   | 1  | 1.741       | .052    | .821 |
| Error            | 1849.054                | 55 | 33.619      |         |      |
| Total            | 43989.000               | 60 |             |         |      |
| Corrected Total  | 2012.850                | 59 |             |         |      |

\*Significant at sig of F < .05, Df= Degree of freedom

The result in Table 3 shows the F-calculated values for effects of treatment on Technical college students' Academic achievement when taught RTVE using Felder- Silverman and Honey - Mumford learning models. The F-calculated value for treatment groups is 0.246with

a significance criterion (sig) at 0.000 which is less than 0.05. This means that the null hypothesis was rejected. Therefore, there is significant difference between the achievements mean scores of student with Felder–Silverman Honey–Mumford learning models.

**H<sub>02</sub>:** There is no significant difference between the effect of Felder–Silverman learning model and Honey–Mumford learning models on students’ interest in RTVE

**Table 4: Summary of ANCOVA of Interest Score of Student Taught RTVE with Felder-Silverman Learning Model and Honey-Mumford Learning Model**

| Source          | Type III Sum of Squares | Df | Mean Square | F       | Sig. |
|-----------------|-------------------------|----|-------------|---------|------|
| Corrected Model | .702 <sup>a</sup>       | 4  | .176        | 2.505   | .052 |
| Intercept       | 11.399                  | 1  | 11.399      | 162.650 | .000 |
| preQues         | .035                    | 1  | .035        | .494    | .000 |
| Gender          | .129                    | 1  | .129        | 1.837   | .000 |
| RTVII           | .337                    | 1  | .337        | 4.810   | .033 |
| Geder * group   | .000                    | 1  | .000        | .006    | .937 |
| Error           | 3.855                   | 55 | .070        |         |      |
| Total           | 579.237                 | 60 |             |         |      |
| Corrected Total | 4.557                   | 59 |             |         |      |

\*Significant at sig of F < .05, Df= Degree of freedom

The result in Table 4 shows the F-calculated values for effects of treatment on students’ interest when taught RTVE using Felder-Silverman and Honey-Mumford learning models. The F-calculated value for treatment groups is 4.810 with a significance criterion (sig) at 0.033 which is less than 0.05. This means that the null-hypothesis was rejected. Therefore, there is a significant difference between the effect of Felder–Silverman learning model and Honey–Mumford learning models on students’ interest when taught RTVE using Felder–Silverman learning model and Honey–Mumford learning models.

## DISCUSSION

Finding on research question one revealed that Felder-Silverman learning model and Honey-Mumford learning model are effective in improving students’ Academic achievement in RTVE, but the effect of Felder - Silverman learning model in improving students’ academic achievement in RTVE is higher than Honey–Mumford learning model. Analysis of covariance was used to test the first hypothesis shows the F-calculated values for effects of treatment on Technical college students’ Academic achievement when taught RTVE using Felder-Silverman and Honey-Mumford learning models. The F-calculated value for treatment groups is 0.246 with a significance criterion (sig) at 0.422 which is greater than 0.05. The result shows that the difference between the effect of Felder - Silverman learning model and Honey-Mumford learning model in RTVE academic achievement was statistically significant.

This means that Felder -Silverman learning model is more effective than Honey- Mumford learning model in improving students’ academic achievement in RTVE. These findings are consistent with the findings of Chen and Manjit (2015), Akinbobola, (2015) and Sharon (2014) who, in their report found that the Felder– Silverman based instructions had significant effect upon the students’ academic achievement than other instructional models..

The findings of this study also support some literature evidence such as Kolb and Kolb (2005) who stated that when learners are exposed to new ideas that are presented through different intelligences, they will have a better chance to learn, remember the information and apply their learning experiences to other situations which can lead to higher achievement. Therefore, the result of this study with regard to students’ academic achievement is attributed to the treatment given to students in Felder -Silverman learning model group and Honey-Mumford learning model group. The findings could be explained by the fact that teacher’s adoption of various instructional techniques (such as active learning, Global learning, visual learning, Verbal learning and reflective learning) in the Felder - Silverman classroom appealed to the students’

different learning style and engaged the students in the learning process which increased their motivation to learn and strengthened their memory.

The results could as well be explained thus: giving students opportunity to participate actively in the classroom through free interaction with the teacher and their peers and allowing them to learn in groups and assess their performance themselves which in turn engaged the students in the learning process. This, in turn, improved their learning and thinking abilities which led to deeper understanding of difficult technology concepts and principles associated with RTVE. It implies that students in Felder - Silverman learning model group remembered and applied more of their learning in RTVE than the other group of students that were taught through Honey - Mumford learning model. Also there was more opportunity for students' participation in the class activities base on the different learning styles covered by Felder-Silverman learning model as to that covered in Honey-Mumford. This discovery is in agreement with the opinion of Akinbobola (2015) that reported that Felder-Silverman learning model has the ability to involve learners in more active participation based on tendencies, acknowledging the fact that learners with a high performance for certain behaviour can also act differently on occasions and also the Felder-Silverman learning model describes the learning style of a learner in more detailed form which provides the teacher better understanding of the students more than the Honey- Mumford learning model that streamline students learning into just four style.

Additionally, the findings for research question two revealed that Felder - Silverman learning model and Honey - Mumford learning model are effective in improving students' interest in RTVE, but the effect of Felder - Silverman learning model in improving students' interest in RTVE is higher than Honey - Mumford learning model. Analysis of covariance was employed to test hypothesis four at the calculated F- value (4.810) significance of F (0.033) and confidence level of .05. This means that the null-hypothesis was rejected. Therefore, there is a significant difference between the effect of Felder–Silverman learning model and Honey–Mumford learning models on students' interest in RTVE.

This discovery confirmed the findings of Akinbobola (2015) who reported that using Felder-Silverman learning model in the classroom makes lessons more interesting, which causes students to pay more attention to what is taught and then learned. This is as a result of the various activities carried out in the class in other to the need of the various learning styles in the class. Felder and Silverman (1999) also explained that, identifying the student learning style and articulating the lesson around the student' style in the classroom will allow teachers to specifically target all the students. This will activate students' interest and get them involved in the learning process and also give them more exposure to the lesson content, and more opportunities to connect with the material. The results could, therefore, can be further explained by the fact that teaching in accordance to students' strengths (learning styles) engages the students in the learning process. This, consequently, increased their self-esteem and enthusiasm in studying RTVE.

Similarly, the result that Honey - Mumford learning model is effective in stimulating students' interest in studying RTVE supports Ibe (2015) writings which stated that experiential learning is an excellent way to provide students with ownership over their learning progress. This also means the higher this ownership, the higher the intrinsic motivation to learn. The result could be explained by the fact that the experiential learning cycle in Honey - Mumford learning model engaged students in this group in the learning process through experiencing (activist e.g. in solving RTVE faults), reviewing (reflector e.g. in steps/procedures involved in tracing and diagnosing of electrical faults), concluding (theorist e.g. of signs and symptoms of RTVE faults) and planning (pragmatist e.g. of electrical fault finding techniques). This seems to have positive effects on students' interest in studying RTVE.

## **CONCLUSION**

The present rapid change in electrical and electronics technology development which led to the complexity and difficulty in troubleshooting and repair of radio, television and electronic gadget experienced by technical college students has given to the rise in providing better teaching and learning style that will help meet the present day demand. Consequent upon

this, the study determined the effect of Felder–Silverman and Honey – Mumford learning models on students’ achievement and interest in RTVE in Technical Colleges and found out that Felder-Silverman learning model is more effective in improving student’s achievement in RTVE than Honey-Mumford learning model. This then therefore mean that Felder-Silverman learning model is a dependable option for teaching and learning in the present era of rapid technological development as it promote active and efficient learning which can lead to the acquisition of necessary skills for employment.

## RECOMMENDATIONS

Based on the findings of this study, the following recommendations are made:

1. Workshops, seminars and conferences should be organized by both Federal and State Science and Technical Schools Board to enlighten and train RTVE teachers on the application of Felder-Silverman learning model for improving students’ achievement and interest in studying RTVE.
2. National Board for Technical Education (NBTE) should consider the review of curriculum for RTVE with a view to incorporating activities that reflect students’ learning Style to enable students learn more effectively.
3. RTVE teachers in technical colleges should adopt Felder-Silverman learning model in their classroom teaching. This will help the teachers equip RTVE craftsmen with the knowledge and skills needed to easily cope and perform more effectively in the Electrical and Electronic world of work.
4. Both Federal and State Science and Technical Schools Board should equip workshops in technical colleges with relevant modern equipment, tools and machines. This will help improve student’s acquisition and mastery of skills.

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