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# A Study On Effectiveness Of E-Content On Student Learning And Performance Outcome In Selected Established Higher Secondary Schools In Chennai City

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## Abstract

e-Content is a component of digital education that helps professors and students transfer and acquire information both remotely and in person. An e-Content might include a variety of things. Videos, AR/VR, gamification components, and other entertaining items can all be considered resources. Furthermore, you may combine the resources into PDFs with hotspots or even whole interactive classes or courses. One of the most significant tasks of e-Content for instructors is to assist them in energizing pupils and increasing the individualization of the learning process. The present study examines the effectiveness of e-Content learning method on student learning and performance outcome in selected established higher secondary schools in Chennai city. Convenient sampling has been adopted to collect data from student of selected higher secondary schools including government, self-financing and international boards. The findings of the study shows there is significant influence of Student Performance Indicators (SPI) and E-Content Usage (ECU) on Determinants of E-Content (DEC). factors like Virtual Learning and Participation, Resources and Assessment Factor, type of schools student are studying and Learning Gamification and Journal have significant and positive influence on determinants of learning through e-Content.

**Key Words**: Digitalisation, Gamification, Performance, Assessment and Learning

## INTRODUCTION

e-Content is a component of digital education that helps professors and students transfer and acquire information both remotely and in person. An e-Content might include a variety of things. Videos, AR/VR, gamification components, and other entertaining items can all be considered resources. Furthermore, you may combine the resources into PDFs with hotspots or even whole interactive classes or courses. One of the most significant tasks of e-Content for instructors is to assist them in energizing pupils and increasing the individualization of the learning process. Learners are more engaged in the classes and may absorb the content more efficiently when they are given interactive exercises. Furthermore, sessions performed with the assistance of e-Content are considerably more enjoyable.

Two years ago, the global scenario prompted us to adjust our lifestyles and begin working remotely. The schools were no exception. From one day to the next, it was required to fully forsake traditional teaching techniques in favor of employing digital solutions solely.

However, that period demonstrated the necessity of digital learning and its progressive implementation. In digital education, e-Content is not only a method of providing educational content, but also, from the publisher's perspective, any resources that encourage students to participate through video, AR/VR, gamification, and other means.

**USAGE OF e-Content**

1. Remote learning is possible from anywhere in the globe, at any time. e-Content is constantly available, allowing students to learn when it is most convenient for them. All you need to learn is a phone that can show e-content.
2. Enhanced classroom possibilities. e-Content primarily benefits schools and instructors. It creates new opportunities. This allows chemistry classes to contain theoretical information as well as recordings of intriguing experiments that would otherwise be difficult to carry out in the classroom. As a result, students pay greater attention and are more likely to attend class.
3. Adaptive learning is the capacity to change the presentation of content based on a student's performance. Only e-Content allows you to build resources for adaptive learning, stressing maximal individualization of the student's educational experience. Furthermore, interactive e-Content makes it possible to gather Big Data, which aids in the development of adaptive learning resources and gives teachers the ability to monitor students' performance and development.
4. Textbooks are available on electronic devices such as computers, smartphones, and tablets. They are frequently supplied in PDF format, with hotspots attached.
5. Gamification is the use of game elements in the educational process. Thanks to this, students remember the content much better, and their involvement in the classes increases. Gamification is an interesting variety from the simple course of lessons, learning through play. Children also learn healthy competition and cooperation with other players thanks to various games.

**EFFECTIVE TEACHING**

Effective teaching include the knowledge, techniques, procedures, and behaviors that result in positive student results. Effective instructors have a positive influence on their pupils and apply their knowledge to boost learning. These positive outcomes are frequently ones that may be easily quantified, typically by summative evaluation. However, it is crucial to note that not all characteristics of good teaching are immediately visible or measurable. Effective instructors foster positive working connections with their pupils in a safe and courteous atmosphere. Effective teaching is more than just end-of-year data; it is a continuous, reflective activity that must be modified and adjusted to meet the requirements of the learners. Effective instructors cultivate effective students who actively participate in their own education and personal growth. They may manage a classroom to eliminate or lessen challenging behavior, provide new knowledge in an engaging and accessible manner, and arouse interest in the subject matter to foster higher-order thinking. Effective instructors are passionate about their subjects and use their expertise and pedagogical skills to offer high-quality learning opportunities.

Effective teaching is widely regarded as a fundamental driver of school progress. As the popular saying goes, a school is only as good as its instructors. Effective teaching enables students to attain their personal and academic objectives. We know that great teachers can

have a significant impact on many young people, giving them with clarity and confidence when they most need it. Children who feel protected, appreciated, and engaged in their school community learn better and contribute to a better culture by encouraging positive attitudes and behavior. Effective teaching may have a significant influence on student success. Improved interactions with students lead to more tailored learning opportunities and higher-quality focused assessment. Capturing an accurate snapshot of student knowledge helps to accelerate development since both instructors and students understand how to enhance learning outcomes.

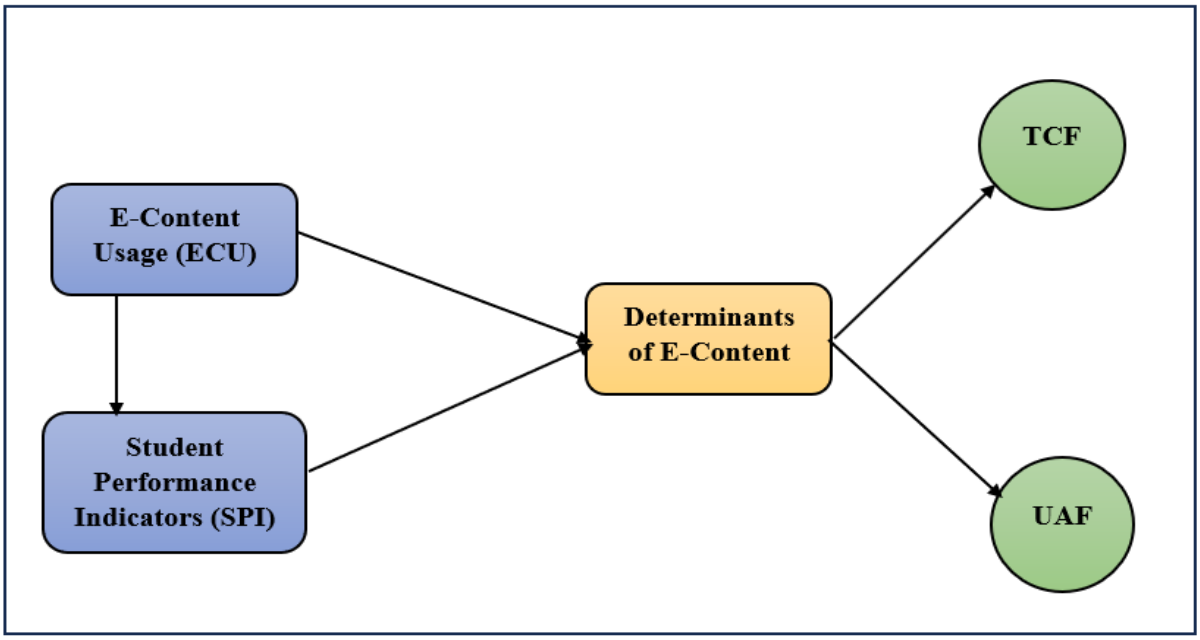
**EFFECTIVENESS OF e-Content LEARNING**

E-learning demonstrates the functions of global communication, message switching, cooperative learning, and instant messaging. When used correctly, it addresses conventional media shortcomings while increasing the high application value of learning effectiveness. Furthermore, instructors might arrange the content and Internet resources for learning Internet learners, teachers, and classmates by exploiting the ease of the Internet for "Internet-assisted teaching," and publishing the e-learning content created by teachers on websites. Internet-based instruction necessitates the use of learning management platforms and digital resources. The learning management platform is an online instructional technology that allows teachers and students to communicate. The learning management platform allows students to engage in debate, observation, and cooperative group learning. The platform allows teachers to deliver teaching and guiding activities.

Digital material exists in a variety of formats and features. Simulation software has the ability to compress time, slow down processes, allow student engagement, provide safe trials, and save money and other resources, so making the impossible feasible. E-learning information may be reused in a variety of formats and scenarios. As a result, the shape of digital material influences online learning. Proper training is required to enable teachers to deal with diverse types of learners. To maximize advantage, the information should be tailored to the learners' learning styles, expectations, and instructional methodologies. According to Belonovskaya et al. (2020), ongoing education is important not only for current young, but also for older generations who will be influenced by new technology in the near future. This research investigates a novel form of e-learning content geared at product design students. Learning motivation and effectiveness are also examined. Various communication teaching strategies for digital information are meant to assist students in dealing with learning challenges through conversation, analysis, and induction. The models might assist pupils in establishing right concepts and developing problem-solving skills.

**CONCEPTUAL MODEL**

In line with the preceding hypotheses, a conceptual model was constructed and shown in below fig.




## METHODOLOGY

### STUDY DESIGN AND APPROACH

The study applied cross sectional design by quantitative research method to examine the response obtain from student of higher secondary class from various type of educational institution established in Chennai city in order to check usage and application of E-content in teaching by their respective schools. The study priorly examine the usage of e-content by students followed by student performance after adopting e-content learning and the determents of E-content used by student for learning digitally. The data were collected from 233 student of higher secondary class belongs to government, self-finance and international schools established in Chennai city. Chennai is well know for educational hub of India consist of number of private and public educational institutions. The data were collected from students studying in higher secondary class with digital content platforms. Convenient sampling has been used to collect data from the students in Chennai city.

### SAMPLE SIZE AND DATA COLLECTION

Both online survey and offline method has been used to collect data from students of higher secondary class. To observe the sample size for the study Krejcie and Morgan (1970) sampling method has been implemented. The identified sample of 233 is convenient for the present study. The questionnaire was designed with appropriate scales of both five point scale and five point Likeart scale. Reliability test has been conducted to check the consistency of the scale used for development of questionnaire. The questionnaire have three section, the first section consist of Determinants of E-Content (DEC) consisting ten variables measured with 5 point Likear scale of strongly agree to strongly disagree with an weightage of 5,4,3,2 and 1 respectively followed by the second section deals with E-Content Usage (ECU) consisting eleven variables measured with 5 point likeart scale of strongly agree to strongly disagree with an weightage of 5,4,3,2 and 1 respectively and the third section deals with Student Performance Indicators (SPI) consist of twelve variables measured with 5 point scale with and weightage of 5,4,3,2 and 1 respectively.

## DATA ANALYSIS AND INTERPRETATION

The collected data were subjected to statistical analysis, hence number of multivariate statistics has been used to examine the significant relationships among the variables and the results are shown in below tables.

**Table 1**

**Factorization of Determinants of E-Content (DEC) Variables**

| Determinants of E-Content (DEC) | Factor Loadings | Mean | Std. Deviation | Communalities | Eigen value | Variance Explained | Factor Name |
|---|---|---|---|---|---|---|---|
| Clear Navigation | 0.842 | 4.140 | 0.798 | 0.711 | 2.655 | 26.546% | Triangulation and Constrains Factor (TCF) |
| Appropriate level of challenge | 0.699 | 4.210 | 0.729 | 0.508 | | | |
| Multimedia Integration | 0.646 | 4.300 | 0.774 | 0.462 | | | |
| Interactive features | 0.577 | 4.310 | 0.749 | 0.482 | | | |
| Compatibility across all devices | 0.522 | 4.350 | 0.704 | 0.411 | | | |
| Perceived usefulness | 0.400 | 4.170 | 0.884 | 0.268 | | | |
| Ease of usage | 0.780 | 4.300 | 0.802 | 0.618 | 2.398 | 23.980% | Usefulness and Accessibility Factor (UAF) |
| Accessibility | 0.758 | 4.330 | 0.776 | 0.608 | | | |
| Alignment with learning objectives | 0.718 | 4.380 | 0.768 | 0.542 | | | |
| Relevance to target audience | 0.486 | 4.360 | 0.719 | 0.442 | | | |
| **KMO and Bartlett's Test: 0.821, Chi-square: 618.951, Df:45, P<0.000** | | | | | | | |

Table 1 shows factor analysis of ten DEC variables, the ten DEC variables has been factorized into two dominant factors together explaining 50.530% of overall variance. The KMO value of 0.820 with Chi-square value of 618.951 is significant at 1% level of significance P<0.000. The ten DEC variables can be factorized into underlying latent factors using factor analysis test. The fist dominant factor 1 which explaining variance of 26.546% in explaining DEC with Eigen value of 2.655 and it contain six variables namely Clear Navigation, Appropriate level of challenge, Multimedia Integration, Interactive features, Compatibility across all devices and Perceived usefulness based on the intercorrelation and relative position of the variables it has been termed as **Triangulation and Constrains Factor (TCF).** The second dominant factor is factor 2 which explaining variance of **23.980%** in explaining DEC with Eigen value of 2.398 and it consist of four variables namely Ease of usage, Accessibility , Alignment with learning objectives and Relevance to target audience based on the intercorrelation and relative position of the variables it has been labelled as **Usefulness and Accessibility Factor (UAF)**.

**Table 2**

**Factorization of E-Content Usage (ECU) Variables**

| E-Content Usage (ECU) | Factor Loadings | Mean | Std. Deviation | Communalities | Eigen value | Variance Explained | Factor Name |
|---|---|---|---|---|---|---|---|
| Social media | 0.774 | 4.320 | 0.744 | 0.650 | 2.868 | 26.075% | Social Media and Animation Learning Factor (SMALF) |
| Animated explainers' videos | 0.747 | 4.370 | 0.767 | 0.672 | | | |
| Digital textbooks | 0.727 | 4.450 | 0.675 | 0.589 | | | |
| Projectors | 0.612 | 4.360 | 0.781 | 0.470 | | | |
| Worksheets and tasks | 0.597 | 4.160 | 0.845 | 0.369 | | | |
| Virtual Labs | 0.839 | 4.180 | 0.725 | 0.727 | 2.230 | 20.273% | Virtual Learning and Participation Factor (VLPF) |
| Practice Exercises | 0.815 | 4.320 | 0.796 | 0.700 | | | |
| Online discussion forum | 0.560 | 4.370 | 0.805 | 0.516 | | | |
| Audio podcast | 0.545 | 4.310 | 0.755 | 0.482 | | | |
| Gamified learning | 0.855 | 4.520 | 0.670 | 0.767 | 1.551 | 14.097% | Learning Gamification and Journal Factor (LGJF) |
| e-Journals | 0.789 | 4.490 | 0.637 | 0.708 | | | |
| **KMO and Bartlett's Test: 0.824, Chi-square: 849.048, Df:55, P<0.000** | | | | | | | |

Table 2 shows factor analysis for eleven E-Content Usage (ECU) variables, the eleven E-Content Usage (ECU) variables has been factorized into three dominant underlying factors which together explaining variance of 60.450% in ECU. The KMO value of 0.824 with Chi-square value of 849.048 is significant at 1% level of significance P<0.000. The eleven ECU variables can be factorized into underlying latent factors using factor analysis test. The first dominant factor 1 which explaining variance of 26.075% in explaining ECU with Eigen value of 2.868 and it consist of five variables namely Social media, Animated explainers' videos, Digital textbooks, Projectors and Worksheets and tasks base on the intercorrelation among the variables and relative positive it has been termed as **Social Media and Animation Learning Factor (SMALF).** The second dominant factor 2 which explaining 20.270% of variance in explaining ECU with Eigen value of 2.230 and it consist of four variables namely Virtual Labs, Practice Exercises, Online discussion forum and Audio podcast based on the intercorrelation among the variables it has been named as **Virtual Learning and Participation Factor (VLPF).** The third dominant factor 3 which explaining 14.100% of variance in explaining ECU with Eigen value of 1.551 and it consist of two variables namely Gamified learning and e-Journals based on the intercorrelation between the variables it has been termed as **Learning Gamification and Journal Factor (LGJF).**

**Table 3**
**Factorization of Student Performance Indicators (SPI) Variables**

| Student Performance Indicators (SPI) | Factor Loadings | Mean | Std. Deviation | Communalities | Eigen value | Variance Explained | Factor Name |
|---|---|---|---|---|---|---|---|
| In campus resources | 0.732 | 4.300 | 0.692 | 0.541 | | | |
| GPA | 0.679 | 4.340 | 0.739 | 0.516 | | | |
| Able to describe problem solving process | 0.674 | 4.290 | 0.742 | 0.505 | | | |
| Knowledge of professional ethics | 0.629 | 4.250 | 0.718 | 0.456 | **2.859** | **33.824%** | **Resources and Assessment Factor (RAF)** |
| Student and faculty relation | 0.539 | 4.310 | 0.755 | 0.392 | | | |
| Rank in Class | 0.519 | 4.320 | 0.734 | 0.350 | | | |
| Awards and Achievements | 0.414 | 4.370 | 0.805 | 0.295 | | | |
| Standardised test scores | 0.825 | 4.300 | 0.741 | 0.682 | | | |
| Graduation rate | 0.768 | 4.440 | 0.687 | 0.626 | | | |
| Attendance rate | 0.747 | 4.310 | 0.783 | 0.633 | **2.760** | **22.998%** | **Test and Rating Factor (TRF)** |
| Number of training sessions | 0.484 | 4.520 | 0.670 | 0.291 | | | |
| Code of ethics | 0.468 | 4.490 | 0.637 | 0.333 | | | |
| **KMO and Bartlett's Test: 0.825, Chi-square: 829.108, Df:66, P<0.000** | | | | | | | |

Table 3 shows factor analysis for twelve Student Performance Indicators (SPI) variables, the twelve SPI variables has been factorized into two dominant underlying factors which together explaining variance of 56.820% in SPI. The KMO value of 0.825 with Chi-square 829.108 is significant at 1% level of significance P<0.000. The twelve SPI variables can be factorized into underlying latent factor using factor analysis test. The first dominant factor 1 which explaining variance of 33.824% in explaining SPI with Eigen value of 2.859 and it holds seven variables namely In campus resources, GPA, Able to describe problem solving process, Knowledge of professional ethics, Student and faculty relation, Rank in Class and Awards and Achievements based on the intercorrelation among the variables and relative position it has been labelled as **Resources and Assessment Factor (RAF).** The second dominant factor 2 which explaining **22.998%** of variance in explaining SPI with Eigen value of 2.760 and it consist of five variables namely Standardized test scores, Graduation rate, Attendance rate, Number of training sessions and Code of ethics based on the intercorrelation among the variables it has been named as **Test and Rating Factor (TRF).**

**Table 4**

**Significant Influence of Student Performance Indicators (SPI) and E-Content Usage (ECU) on Determinants of E-Content (DEC)**

| | Unstandardized Coefficients | Standardized Coefficients | t | P value |
|---|---|---|---|---|

| | B | Std. Error | Beta | | |
|---|---|---|---|---|---|
| (Constant) | 10.822 | 1.936 | | 5.591 | 0.000** |
| **VLPF** | 0.891 | 0.095 | 0.526 | 9.336 | 0.000** |
| **RAF** | 0.422 | 0.080 | 0.699 | 5.298 | 0.000** |
| **School Type** | 0.789 | 0.793 | 0.588 | 4.810 | 0.000** |
| **LGJF** | 0.683 | 0.04 | 0.525 | 6.220 | 0.000** |
| **R:0.753, $R^2$: 0.568, Adjusted $R^2$: 0.564, F=150.914(P<0.000)** | | | | | |

Table 4 shows the linear combination of social economic profile of students of higher secondary class, Student Performance Indicators (SPI) and E-Content Usage (ECU) in determining the Determinants of E-Content (DEC) **{F[2,230]= 150.914, P<0.000}.** The Co-efficient value shows percentage of variance explained by independent variables in Determinants of E-content usage which is 0.568 or 56.8% accounted by combination of factors of Student Performance Indicators (SPI) and factors of E-Content Usage (ECU). VLPF have significant and positive impact on Determinants of E-Content (DEC), the standard beta value of 0.526 indicates, partial effect of Virtual Learning and Participation Factor (VLPF) on Determinants of E-Content usage keeping other factors as constant. The relationship shows 0.536-unit change in Determinants of E-Content usage is due to one standard unit change in Virtual Learning and Participation Factor (VLPF). RAF have significant and positive influence on Determinants of E-Content (DEC), the standard beta value of 0.699 indicates, partial effect of Resources and Assessment Factor (RAF) on Determinants of E-Content keeping other factors as constant. The relationship indicates 0.699-unit change in Determinants of E-content usage is due to one standard unit change in Resources and Assessment Factor. Type of school have significant and positive influence on Determinants of E-Content, there is partial effect of type of school student are studying on determinants of E-content. The relationship indicates that students studying in private and international school are more engaged with E-content learning compare to those studying in government schools. LGJF have significant and positive influence on Determinants of E-content, the standard beta value of 0.525 indicates, partial effect of Learning Gamification and Journal Factor (LGJF). LGJF have significant and positive effect on Determinants of E-content keeping other variables as constant. The relationship indicates 0.525 unit change in Determinants of E-content is due to one standard unit change in Learning Gamification and Journal Factor.

**IMPACT OF STUDENT PERFORMANCE INDICATORS (SPI) AND E-CONTENT USAGE (ECU) ON DETERMINANTS OF E-CONTENT (DEC)**

SEM model has been developed and used to examine the significant prediction on influence of Student Performance Indicators (SPI) And E-Content Usage (ECU) on Determinants of E-Content (DEC). SEM is identified to be the good Multivariate statistical method in isolating the higher number of observed variables in development of equation based model in comparison to other statistical methods. The factor score has been implemented to determine the discriminant validity and convergent validity for the constructed SEM model. The constructed model holds standardised Co-efficient values identified after eradicating the error in the equation using log values and displayed in the

below figure.

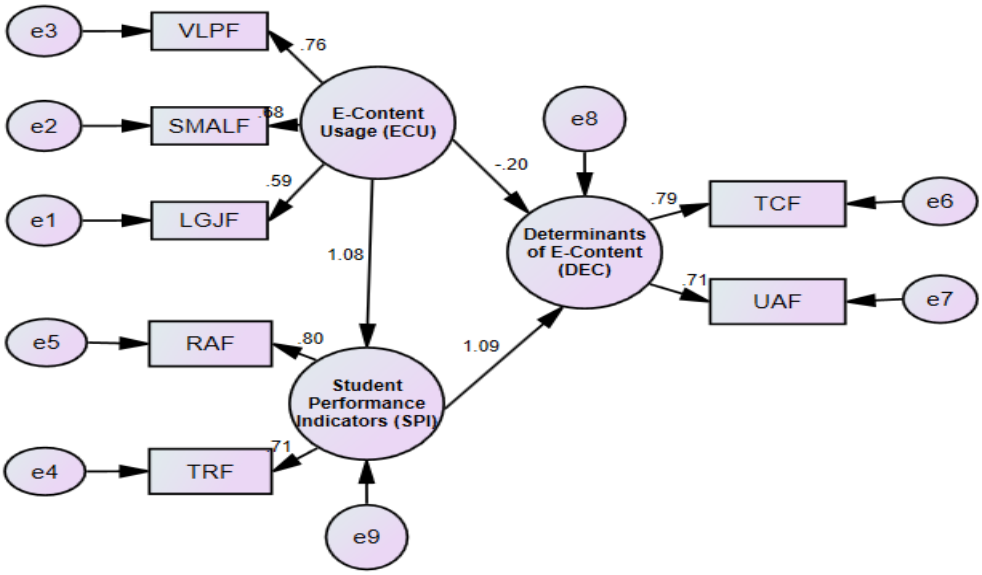



**Fig. 1.**

**SEM for impact of Student Performance Indicators (SPI) And E-Content Usage (ECU) on Determinants of E-Content (DEC).**

**Ho:** *There is no significant influence of Student Performance Indicators (SPI) And E-Content Usage (ECU) on Determinants of E-Content (DEC).*

**Table 4**

**Regression Weight for Determinants of E-Content (DEC)**

| Measured Variables | | Latent Variables | Std. Co-efficient | C.R. | P-value |
|---|---|---|---|---|---|
| SPI | <-- | ECU | 1.083 | 8.418 | **0.000**** |
| DEC | <-- | ECU | 1.198 | 10.454 | **0.000**** |
| DEC | <-- | SPI | 1.094 | 2.548 | **0.000**** |
| LGJF | <-- | ECU | 0.588 | 5.662 | **0.000**** |
| SMALF | <-- | ECU | 0.683 | 8.598 | **0.000**** |
| VLPF | <-- | ECU | 0.764 | 9.280 | **0.000**** |
| TRF | <-- | SPI | 0.709 | 7.214 | **0.000**** |
| RAF | <-- | SPI | 0.801 | 11.476 | **0.000**** |
| TCF | <-- | DEC | 0.794 | 8.113 | **0.000**** |
| UAF | <-- | DEC | 0.708 | 10.400 | **0.000**** |

**Notes:** ***Significant at 1% level*

**$H_1$:** ***There is no significant influence of E-Content Usage (ECU) on Student***

***Performance Indicators (SPI).***

The beta coefficient value of 1.083 indicating significant influence of E-Content Usage (ECU) on Student Performance Indicators (SPI), which indicates partial effect over Student Performance Indicators holding other independent variables as constant. The Student Performance Indicators would have enhanced by 1.083 unit for every one standard unit change in E-Content Usage among students.

**$H_2$:** ***There is no significant influence of E-Content Usage (ECU) on Determinants of E-Content (DEC).***

The beta coefficient value of 1.198 indicating significant influence of E-Content Usage (ECU) on Determinants of E-Content (DEC), which indicates partial effect over Determinants of E-Content holding other independent variables as constant. The Determinants of E-Content would have enhanced by 1.198 unit for every one standard unit change in E-Content Usage among students.

**$H_3$:** ***There is no significant influence of Student Performance Indicators (SPI) on Determinants of E-Content (DEC).***

The beta coefficient value of 1.094 indicating significant influence of Student Performance Indicators (SPI) on Determinants of E-Content (DEC), which indicates partial effect over Determinants of E-Content holding other independent variables as constant. The Determinants of E-Content would have enhanced by 1.094 unit for every one standard unit change in Student Performance Indicators.

**$H_4$:** ***There is no significant influence of E-Content Usage (ECU) on Social Media and Animation Learning Factor (SMALF), Virtual Learning and Participation Factor (VLPF) and Learning Gamification and Journal Factor (LGJF).***

The beta coefficient value of 0.588 indicating significant influence of E-Content Usage (ECU) on Social Media and Animation Learning Factor (SMALF), which indicates partial effect over Social Media and Animation Learning Factor holding other independent variables as constant. The Social Media and Animation Learning Factor would have increased by 0.588 unit for every one standard unit change in E-Content Usage. The beta coefficient value of 0.683 indicating significant influence of E-Content Usage (ECU) on Virtual Learning and Participation Factor (VLPF), which indicates partial effect over Virtual Learning and Participation Factor holding other independent variables as constant. The Virtual Learning and Participation Factor would have increased by 0.683 unit for every one standard unit change in E-Content Usage. The beta coefficient value of 0.764 indicating significant influence of E-Content Usage (ECU) on Learning Gamification and Journal Factor (LGJF), which indicates partial effect over Learning Gamification and Journal Factor holding other independent variables as constant. The Learning Gamification and Journal Factor would have increased by 0.764 unit for every one standard unit change in E-Content Usage (ECU).

**$H_5$:** ***There is no significant influence of Student Performance Indicators (SPI) on Resources and Assessment Factor (RAF) and Test and Rating Factor (TRF).***

The beta coefficient value of 0.709 indicating significant influence of Student Performance Indicators (SPI) on Resources and Assessment Factor (RAF), which indicates partial effect over Resources and Assessment Factor holding other independent variables as constant. The Resources and Assessment Factor would have increased by 0.709 unit for

every one standard unit change in Student Performance Indicators. The beta coefficient value of 0.801 indicating significant influence of Student Performance Indicators (SPI) on Test and Rating Factor (TRF), which indicates partial effect over Test and Rating Factor holding other independent variables as constant. The Test and Rating Factor would have increased by 0.801 unit for every one standard unit change in Student Performance Indicators.

**$H_6$:** ***There is no significant influence of Determinants of E-Content (DEC) on Triangulation and Constrains Factor (TCF) and Usefulness and Accessibility Factor (UAF).***

The beta coefficient value of 0.794 indicating significant influence of Determinants of E-Content (DEC) on Triangulation and Constrains Factor (TCF), which indicates partial effect over Triangulation and Constrains Factor holding other independent variables as constant. The Triangulation and Constrains Factor would have increased by 0.794 unit for every one standard unit change in Determinants of E-Content. The beta coefficient value of 0.708 indicating significant influence of Determinants of E-Content (DEC) on Usefulness and Accessibility Factor (UAF), which indicates partial effect over Usefulness and Accessibility Factor holding other independent variables as constant. The Usefulness and Accessibility Factor would have increased by 0.708 unit for every one standard unit change in Determinants of E-Content.

## RESULTS AND DISCUSSION

The ten DEC variables has been factorized into two dominant factors together explaining 50.530% of overall variance. The fist dominant factor 1 contain six variables namely Clear Navigation, Appropriate level of challenge, Multimedia Integration, Interactive features, Compatibility across all devices and Perceived usefulness based on the intercorrelation and relative position of the variables it has been termed as Triangulation and Constrains Factor (TCF). The second dominant factor is factor 2 which consist of four variables namely Ease of usage, Accessibility , Alignment with learning objectives and Relevance to target audience based on the intercorrelation and relative position of the variables it has been labelled as Usefulness and Accessibility Factor (UAF).

The eleven E-Content Usage (ECU) variables has been factorized into three dominant underlying factors which together explaining variance of 60.450% in ECU. The first dominant factor 1 which consist of five variables namely Social media, Animated explainers' videos, Digital textbooks, Projectors and Worksheets and tasks base on the intercorrelation among the variables and relative positive it has been termed as Social Media and Animation Learning Factor (SMALF). The second dominant factor 2 which consist of four variables namely Virtual Labs, Practice Exercises, Online discussion forum and Audio podcast based on the intercorrelation among the variables it has been named as Virtual Learning and Participation Factor (VLPF). The third dominant factor 3 which consist of two variables namely Gamified learning and e-Journals based on the intercorrelation between the variables it has been termed as Learning Gamification and Journal Factor (LGJF).

The twelve SPI variables has been factorized into two dominant underlying factors which together explaining variance of 56.820% in SPI. The first dominant factor 1 which holds seven variables namely In campus resources, GPA, Able to describe problem solving process, Knowledge of professional ethics, Student and faculty relation, Rank in Class and

Awards and Achievements based on the intercorrelation among the variables and relative position it has been labelled as Resources and Assessment Factor (RAF). The second dominant factor 2 which consist of five variables namely Standardized test scores, Graduation rate, Attendance rate, Number of training sessions and Code of ethics based on the intercorrelation among the variables it has been named as Test and Rating Factor (TRF).

VLPF have significant and positive impact on Determinants of E-Content (DEC), the standard beta value of 0.526 indicates, partial effect of Virtual Learning and Participation Factor (VLPF) on Determinants of E-Content usage keeping other factors as constant. The relationship shows 0.536-unit change in Determinants of E-Content usage is due to one standard unit change in Virtual Learning and Participation Factor (VLPF). RAF have significant and positive influence on Determinants of E-Content (DEC), the standard beta value of 0.699 indicates, partial effect of Resources and Assessment Factor (RAF) on Determinants of E-Content keeping other factors as constant. The relationship indicates 0.699-unit change in Determinants of E-content usage is due to one standard unit change in Resources and Assessment Factor. Type of school have significant and positive influence on Determinants of E-Content, there is partial effect of type of school student are studying on determinants of E-content. The relationship indicates that students studying in private and international school are more engaged with E-content learning compare to those studying in government schools. LGJF have significant and positive influence on Determinants of E-content, the standard beta value of 0.525 indicates, partial effect of Learning Gamification and Journal Factor (LGJF). LGJF have significant and positive effect on Determinants of E-content keeping other variables as constant. The relationship indicates 0.525 unit change in Determinants of E-content is due to one standard unit change in Learning Gamification and Journal Factor.

There is significant influence of E-Content Usage (ECU) on Student Performance Indicators (SPI), which indicates partial effect over Student Performance Indicators holding other independent variables as constant. The Student Performance Indicators would have enhanced by 1.083 unit for every one standard unit change in E-Content Usage among students. There is significant influence of E-Content Usage (ECU) on Determinants of E-Content (DEC), which indicates partial effect over Determinants of E-Content holding other independent variables as constant. The Determinants of E-Content would have enhanced by 1.198 unit for every one standard unit change in E-Content Usage among students. Significant influence of Student Performance Indicators (SPI) on Determinants of E-Content (DEC) has been identified which indicates partial effect over Determinants of E-Content holding other independent variables as constant. The Determinants of E-Content would have enhanced by 1.094 unit for every one standard unit change in Student Performance Indicators.

Significant influence of E-Content Usage (ECU) on Social Media and Animation Learning Factor (SMALF) has been observed, which indicates partial effect over Social Media and Animation Learning Factor holding other independent variables as constant. The Social Media and Animation Learning Factor would have increased by 0.588 unit for every one standard unit change in E-Content Usage. The beta coefficient value of 0.683 indicating significant influence of E-Content Usage (ECU) on Virtual Learning and Participation Factor (VLPF), which indicates partial effect over Virtual Learning and Participation Factor

holding other independent variables as constant. The Virtual Learning and Participation Factor would have increased by 0.683 unit for every one standard unit change in E-Content Usage. The beta coefficient value of 0.764 indicating significant influence of E-Content Usage (ECU) on Learning Gamification and Journal Factor (LGJF), which indicates partial effect over Learning Gamification and Journal Factor holding other independent variables as constant. The Learning Gamification and Journal Factor would have increased by 0.764 unit for every one standard unit change in E-Content Usage (ECU). Significant influence of Student Performance Indicators (SPI) on Resources and Assessment Factor (RAF), which indicates partial effect over Resources and Assessment Factor holding other independent variables as constant. The Resources and Assessment Factor would have increased by 0.709 unit for every one standard unit change in Student Performance Indicators. The beta coefficient value of 0.801 indicating significant influence of Student Performance Indicators (SPI) on Test and Rating Factor (TRF), which indicates partial effect over Test and Rating Factor holding other independent variables as constant. The Test and Rating Factor would have increased by 0.801 unit for every one standard unit change in Student Performance Indicators.

## CONCLUSION

The study's findings indicate that interactive modelling content may improve students' learning effectiveness. In the experiment, the experimental and control groups differed significantly in terms of instructional substance. In other words, interactive simulation content may improve the effectiveness of teaching content. This might be a reference for future content design. Interactive simulation material creates simulated circumstances in which students may use computer applications. The human-computer interface enables students to not only take knowledge delivered by sounds and visuals in the material, but also to operate freely, explore, and observe. Students can receive specialized education and be taught based on their aptitudes.

In this scenario, digital information that includes interactive simulations may help to lessen learning style discrepancies. Such an approach might be used in content design to lessen disparities between students with varying learning abilities. Instruction utilizing interactive simulation-based digital teaching materials has the potential to offer a significant quantity of knowledge to learners in a short period of time, but it may also cause cognitive overload in leaders. To reduce learners' cognitive load, the interactive simulation-based digital teaching material design could incorporate unloading, decomposition, drill, cleanup, tagging, adjustment, redundancy elimination, synchronous technology, and personalized design.

The present study determines the effectiveness of e-Content learning method on student learning and performance outcome in selected established higher secondary schools in Chennai city. Convenient sampling has been adopted to collect data from student of selected higher secondary schools including government, self-financing and international boards. The ten DEC variables has been factorized into two dominant factors . The fist dominant factor 1 contain six variables namely Clear Navigation, Appropriate level of challenge, Multimedia Integration, Interactive features, Compatibility across all devices and Perceived usefulness based on the intercorrelation and relative position of the variables it has been termed as Triangulation and Constrains Factor (TCF). The second dominant factor

is factor 2 which consist of four variables namely Ease of usage, Accessibility , Alignment with learning objectives and Relevance to target audience based on the intercorrelation and relative position of the variables it has been labelled as Usefulness and Accessibility Factor (UAF).

The eleven E-Content Usage (ECU) variables has been factorized into three dominant underlying factors. The first dominant factor 1 which consist of five variables namely Social media, Animated explainers' videos, Digital textbooks, Projectors and Worksheets and tasks base on the intercorrelation among the variables and relative positive it has been termed as Social Media and Animation Learning Factor (SMALF). The second dominant factor 2 which consist of four variables namely Virtual Labs, Practice Exercises, Online discussion forum and Audio podcast based on the intercorrelation among the variables it has been named as Virtual Learning and Participation Factor (VLPF). The third dominant factor 3 which consist of two variables namely Gamified learning and e-Journals based on the intercorrelation between the variables it has been termed as Learning Gamification and Journal Factor (LGJF).

The twelve SPI variables have been factorized into two dominant underlying factors. The first dominant factor 1 which holds seven variables namely In campus resources, GPA, Able to describe problem solving process, Knowledge of professional ethics, Student and faculty relation, Rank in Class and Awards and Achievements based on the intercorrelation among the variables and relative position it has been labelled as Resources and Assessment Factor (RAF). The second dominant factor 2 which consist of five variables namely Standardized test scores, Graduation rate, Attendance rate, Number of training sessions and Code of ethics based on the intercorrelation among the variables it has been named as Test and Rating Factor (TRF). The findings of the study shows there is significant influence of Student Performance Indicators (SPI) and E-Content Usage (ECU) on Determinants of E-Content (DEC). factors like Virtual Learning and Participation, Resources and Assessment Factor, type of schools student are studying and Learning Gamification and Journal have significant and positive influence on determinants of learning through eContent.

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