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BAHÇEŞEHİR UNIVERSITY

EVALUATION OF THE EFFICIENCY OF LEARNING ENVIRONMENTS: A COGNITIVE LOAD APPROACH

M.S. Thesis

Abdullah UYULUR

Istanbul, 2011

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September, 2011 Abdullah UYULUR

ABSTRACT

EVALUATION OF THE EFFICIENCY OF LEARNING ENVIRONMENT:
A COGNITIVE LOAD

Uyulur, Abdullah

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Cognitive Load Theory (CLT), which was started in 1980s and expanded in 1990s, is interested in understanding complex cognitive tasks that derive from amount and interaction of the information which is needed to be managed at the beginning of the learning processes. Although different scholars had used different methods for measuring different concepts of cognitive load, the widely accepted and the most meaningful method was developed by Paas and Merrienboer in 1993.

In this thesis, the efficiency of the learning environment of the History of Civilizations class in Bahcesehir University was calculated by using the formula developed by Paas and Merrienboer. The results were interpreted according to different variables of gender, section, and schools of the participants. The results in question were also cross-checked and discussed by using ANOVA method.

Finally, suggestions for improving the efficiency of the learning environment of the class were discussed in the last section.

Keywords: Cognitive Load Theory, Cognitive Overload, Anova Method, SPSS.

ÖZET

ÖĞRENME ORTAMLARININ ETKİNLİĞİNİN DEĞERLENDİRİLMESİ:
BİLİŞSEL YÜK YAKLAŞIMI

Uyulur, Abdullah

Eylül 2011, 87 sayfa

1980'lerde ortaya çıkan ve 1990'larda daha da geliştirilen Bilişsel Yük Kuramı, öğrenme sürecinin başında yönetilmesi gereken bilginin miktarı ve etkileşimden ortaya çıkan karmaşık bilişsel görevleri anlamak ile ilgilenmektedir. Her ne kadar bu gelişim süreci boyunca farklı uzmanlar bilişsel yükün farklı kavramlarını ölçmek için çeşitli metodlar kullanılmış olsalar da, bunlardan en anlamlı ve kabul görmüş olanı Paas ve Merrienboer'in 1993 yılında ortaya koyduğu metod olmuştur.

Bu tezde, Bahçeşehir Üniversitesi'nde okutulan Medeniyetler Tarihi dersinin öğrenme ortamının etkinliği, Paas ve Merrienboer'in geliştirdiği söz konusu metod ile ölçülmüştür. Çıkan sonuçlar cinsiyet, bölüm ve fakülteden oluşan farklı değişkenlere göre yorumlanmıştır. Söz konusu sonuçlar aynı zamanda SPSS aracı kullanılarak ANOVA metodu ile de doğrulanmıştır.

Son olarak, en son bölümde, söz konusu Medeniyetler Tarihi dersinin daha etkin hale getirilmesi için önerilere yer verilmiştir.

Anahtar Kelimeler: Bilişsel Yük Kuramı, Aşırı Bilişsel Yük, Anova Test Metodu, SPSS.

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ABBREVIATIONS

Analysis of Varience	:	ANOVA
Cognitive Load Theory	:	CLT
Statistical Package for the Social Sciences	:	SPSS

1. INTRODUCTION

As the interest in human cognitive structures and processes grew in recent years, consequently, it also introduced a new line of research on instructional design principles. Cognitive Load Theory (CLT) is perhaps the most widely-accepted theory in evaluating such principles. Its supremacy comes from taking both structure of information that learners face with into account, as well as the structure of the human cognitive architecture that lets learners process that information. It puts forward a framework for understanding cognitive processes and learning models, and concerns with developing instructional designs that eases the learning processes of individuals by using the assumed human cognitive architecture with maximum efficiency.

By taking the assumptions of CLT as the general framework, this research aims to analyze the efficiency of the learning environment of the History of Civilizations class that was taught in 2008 – 2009 spring period.

In first part of the research, CLT, its basic assumptions and measurement techniques were briefly summarized. After that, data collected during the 2008 – 2009 spring semester History of Civilizations class was concisely introduced, and the efficiency statuses of 36 regularly – attended students were interpreted according to their genders, sections and faculties. Results under these headings were also cross-checked by using ANOVA test of the SPSS tool. Finally, based on the findings of these interpretations, suggestions for improving the efficiency of the learning environment of the class were discussed in the last section.

2. LITERATURE & BACKGROUND

2.1. COGNITIVE LOAD THEORY

According to Paas, Renkl and Sweller; Cognitive Load Theory (CLT) is interested in understanding complex cognitive tasks that derive from the amount and interaction of the information which is needed to be managed at the beginning of the learning processes. This theory puts forward a framework for understanding cognitive processes and learning models, and "is concerned with the development of instructional methods that efficiently use people's limited cognitive processing capacity to stimulate their ability to apply acquired knowledge and skills to new situations" (Paas, Tuovinen, Tabbers, Van Gerven, 2003:63). In order to understand the aforementioned theory, which was started in 1980s and expanded in 1990s due to technological developments, it is first important to understand its basic assumptions, and evaluate the human cognitive architecture as conceived by cognitive theorists.

2.2. COMPONENTS OF HUMAN COGNITIVE ARCHITECTURE

Cognitive Load theorists assume that there are two types of memory that works within the learning processes of the individuals. These are; working memory and long-term memory.

2.2.1. Working Memory

Working memory - in which conscious cognitive processes occurs - is the restricted one, which is only enough for limited number of information, of possibly no more than seven novel interacting elements at a time. "For example, we are unable to remember, even briefly, an unfamiliar number consisting of more than about seven digits" (Reif, 2008: 86). When gathering and processing new information, almost all information stored in the working memory that is not rehearsed is lost within maximum thirty seconds. That means, "alone, working memory would only permit relatively trivial cognitive activities" (Paas, Renkl, Sweller, 2003: 2).

2.2.2. Long-Term Memory

In contrast to working memory, long-term memory is unlimited and stores the mental *schemas* of the individuals, that are, "cognitive constructs that incorporate multiple elements of information into a single element with a specific function" (Paas, Renkl, Sweller, 2003: 2). These hierarchically organized schemas "categorize elements of information according to how they will be used, thereby facilitating schema accessibility later when they are needed for related tasks" (Artino, 2008: 427). They allow us to organize the problem states that we are faced with, help us to choose most appropriate solution moves. Thus, according to cognitive load theorists, "human intellectual process comes from this stored knowledge, not from an ability to engage in long, complex chains of reasoning in working memory" (Sweller, Marrienboer, Paas, 1998: 254). Based on this assumption, it is plausible to argue that long-term memory reveals the actual mental power of human beings.

As aforementioned before, long-term memory stores knowledge in the form of hierarchically organized schemas, and one of these schemas' "obvious function is to provide a mechanism for knowledge organization and storage" (Sweller, Marrienboer, Paas, 1998: 255). But at the same time, it functions to reduce the load of working memory. Altino explains the latter function of the schemas as follows:

> *"Although working memory can hold only a limited number of items at a time, the size and complexity of those elements are unlimited. Therefore, complex schemas consisting of huge arrays of interrelated elements can be held in working memory as a single entity. As a result, a student dealing with previously learned material that has been stored in long-term memory is , in effect, freed from the processing limitations of working memory – limitations that only apply to novel materials that have no schemas" (Artino, 2008: 428).*

Thus, schema construction functions both as storage and composition within the long-term memory, and reduction of the working memory load.

Automation is a crucial process in schema construction. "Automation occurs when information stored in schemas can be processed automatically and without conscious effort, thereby freeing up working memory resources" (Artino, 2008:428). In order for constructed schemas to be automated, extensive practice is needed.

What are the benefits of schema automation? As Sweller, Marrienboer and Paas described, "with automation, familiar tasks are performed accurately and fluidly, whereas unfamiliar tasks –that partially require the automated processes- can be learned with maximum efficiency because maximum working memory capacity is available" (Sweller, Marrienboer, Paas, 1998: 258). "Furthermore, consistent with the CLT, entirely new tasks may be impossible to complete until prequisite skills have been automated because there simply may not be enough working memory capacity available for learning (van Merrienboer & Sweller, 2005)"(Artino, 2008: 428). Thus, it can be concluded that according to cognitive load perspective, instructional systems and learning techniques should aim for schema construction and automation.

So, in sum, in Paas, Merrienboer and Sweller's words, human cognitive architecture can be summarized as follows:

> *"We have a limited working memory that deals with all conscious activities and an effectively unlimited long-term memory that can be used to store schemas of varying degrees of automaticity. Intellectual skill comes from the construction of large numbers increasingly sophisticated schemas with high degrees of automaticity. Schemas both bring together multiple elements that can be treated as a single element and allow us to ignore myriads of irrelevant elements. Working memory capacity is freed; allowing processes to occur that otherwise would overburden working memory. Automated schemas both allow fluid performance on familiar aspects of tasks and –by freeing working memory capacity- permit levels of performance on unfamiliar aspects that otherwise might be quite impossible" (Sweller, Marrienboer, Paas, 1998: 258)*

So, from the perspective of cognitive load theorists, "it is by this process that human cognitive architecture handles complex material that appears to exceed the capacity of working memory" (Paas, Renkl, Sweller, 2003: 2).

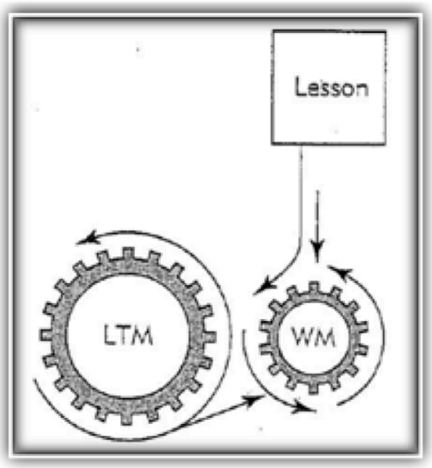

Figure 2.1: Principle of learning processes of the individuals

Figure 1, illustrates the working process of long-term memory and working memory. While information transmitted from an instructor is being analyzed in the working memory, information that is stored in schemas is transmitted to the working memory in order to guide them. In other words, another task of long-term memory is providing consultancy and support to limited working memory, when needed.

"Although schemas are stored in long-term memory, their construction occurs in working memory. Specifically, when learning new material, students must attend to and manipulate relevant pieces of information in working memory before it can be stored in long-term memory" (Artino, 2008: 428). Thus, in order for efficient learning to occur, cognitive load theorists believe that the information that is needed to be processed and constructed in the working memory, the *cognitive load* imposed on the working memory, should be moderated and facilitated. According to Paas & van Merrienboer, "cognitive load can be defined as a multidimensional construct representing the load that performing a particular task imposes on the learner's cognitive system" (Paas, Tuovinen, Tabbers, Van Gerven, 2003: 64). Cognitive load, in other words, is the data loaded to the memory that is being used during a learning process.

2.3. TYPES OF COGNITIVE LOAD

According to CLT, three different types of cognitive load can be categorized. These are; cognitive load, extraneous / ineffective cognitive load, and germane / effective / relevant cognitive load.

2.3.1. Intrinsic Cognitive Load

Intrinsic Cognitive Load is the number of elements that are needed to be processed simultaneously in working memory for schema construction. “Intrinsic cognitive load through element interactivity is determined by an interaction between the nature of the material being learned and the expertise of the learners. It cannot be directly influenced by instructional designers” (Paas, Tuovinen, Tabbers, Van Gerven, 2003: 65).

2.3.2. Extraneous / Ineffective Cognitive Load

Extraneous cognitive load or ineffective cognitive load results from the instructional techniques, which require learners to deal with memory activities that are not related to schema construction or automation. In other words, “it is the extra load beyond the intrinsic cognitive load resulting from mainly poorly designed instruction” (Paas, Tuovinen, Tabbers, Van Gerven, 2003: 65). Much of the early research in CLT revealed that many commonly used instructional designs, such as searching for information that is needed to complete a learning task, call for learners to use cognitive resources that are not related to learning. In addition, intrinsic cognitive load due to element interactivity and extraneous cognitive load due to instructional design are additive (Sweller et al., 1998), the end result may be fewer cognitive resources left in working memory to devote to schema construction and automation during learning. Consequently, learning may suffer (Sweller, 1994).

2.3.3. Germane / Effective / Relevant Cognitive Load

Germane cognitive load “is the load related to processes that contribute to the construction and automation of schemas” (Paas, Tuovinen, Tabbers, Van Gerven, 2003:

65). Germane cognitive load or effective/relevant cognitive load results from beneficial cognitive processes that are advanced by the instructional presentation. When both intrinsic and external cognitive load leave enough working memory resources, learners may "invest extra effort in processes that are directly relevant to learning, such as schema construction. These processes also increase cognitive load, but it is germane cognitive load that contributes to, rather than interferes with, learning" (Sweller, Marrienboer, Paas, 1998: 264).

"Intrinsic, extraneous and germane cognitive loads are additive in that, together, the total load cannot exceed the working memory resources available if learning is to occur" (Paas, Renkl, Sweller, 2003: 2).

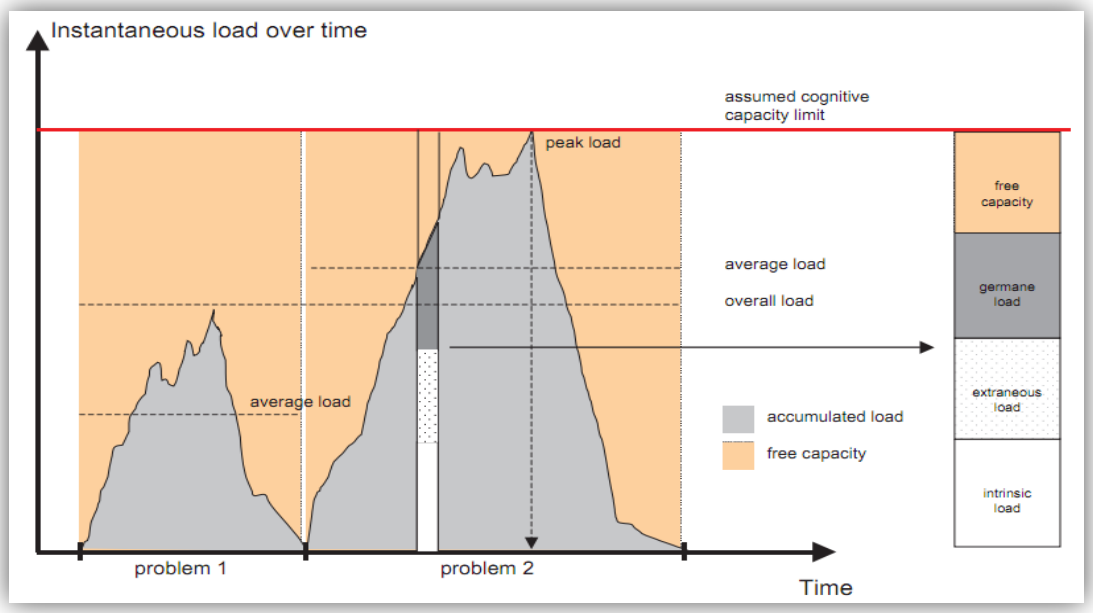

Figure 2.2: Attributes of cognitive load and a framework of cognitive load definitions.

Depending on the cognitive demands imposed on working memory from the three aforementioned types of cognitive load, CLT argues that instructional designers have to focus on three basic issues in order to promote efficient learning. First, they have to decrease the amount of extraneous cognitive load and increase the germane cognitive load by promoting instructional content and activities that benefit the learning goal, and

after that, they need to command intrinsic load by breaking down complex tasks into a series of prequisite tasks and by supporting knowledge. Fig. 3. illustrates this point:

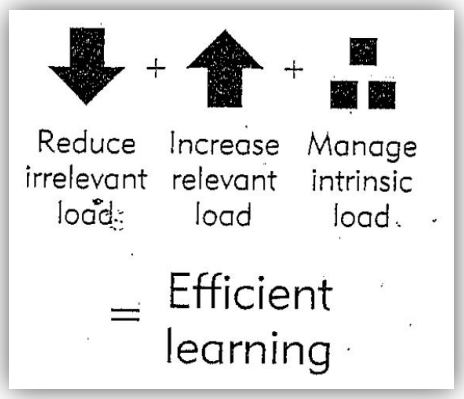

Figure 2.3: Efficient Learning

2.4. COGNITIVE OVERLOAD

The definition of cognitive overload finds its roots in the concept of cognitive load itself. Cognitive overload is defined as being overwhelmed or confused by the options available to users in multipath, multitool environments such as hypermedia document[1]. In general, cognitive overload happens when, after some time, the information exposed students become unworkable, depending on the speed and amount of the information concerned.

The research by Mayer, Moreno, Boire and Vagge was a concrete proof that cognitive overload disrupts success. With the same research, it was also noted that cognitive overload at the same time decreases and disrupts the efficiency of the individuals. For this reason, cognitive overload should be eliminated in order for the information to be transferred to the long-term memory, and for to ease the process of schema construction and automation.

[1] For more information, see Murray, T. (2001). Characteristics and affordances of adaptive hyperbooks. *Proceedings of WebNet 2001,* October 2001, pp. 143 – 154.

There are basically four reasons for cognitive load to become cognitive overload. These are; supply and demand of too many information, the need for handling multitasks and inadequacy of the working environment in reducing the metamemory. Another variable cause of cognitive overload is the difficulty of the task concerned. According to academic researches, when the difficulty of the task increases, the mental effort to complete the task successfully also increases, which in turn, decreases the performance.

2.5. MEASURING COGNITIVE LOAD

Cognitive load can not be observed, as it is dealing with internal processes of information operations. For this reason, scholars tend to find different methods for measuring the different concepts of cognitive load. These methods can be classified as; analytical methods such as mathematical models or task analysis, and empirical methods such as physiological and neurological measurements or performance data techniques. "Table 1 shows that whereas empirical techniques for measuring mental effort have received a lot of attention from CLT researchers, analytical techniques have been used only in one study (Sweller 1988). In particular, rating scale, psychophysiological, and secondary tasks techniques have been used to determine the cognitive load in cognitive load research" (Paas, Tuovinen, Tabbers, Van Gerven, 2003: 66).

> *"Although the individual measures of cognitive load can be considered important to determine the power of different instructional conditions, a meaningful interpretation of a certain level of cognitive load can only be given in the context of its associated performance level and vice versa." (Paas, Tuovinen, Tabbers, Van Gerven, 2003: 67).*

Such a method for meaningful interpretation was developed by Paas and Merrienboer, which takes both performance and mental efforts of the individuals into account in determining the efficiency of the learning environments in question.

Paas and van Merrienboer's method takes mental effort and task performance scores of the students and standardize and convert them to z value. After that, the necessary

measurements are made by employing average as 0 and standard deviation as 1. The aforementioned z value is the axes in the coordinate system.

Table 2.1: Studies of cognitive load and calculated efficiency and the measurement technique they used.

Studies	*Cognitive Load Measurement Technique*	*Mental Efficiency*
Sweller (1988)	PS, ST	
Paas (1992)	RS9	
Paas & van Merriënboer (1993)	RS9	ME
Paas & van Merriënboer (1994b)	RS9, HRV	ME
Cerpa, Chandler, & Sweller (1996)	RS9	ME
Chandler & Sweller (1996)	ST	
Marcus, Cooper, & Sweller (1996)	RS7, ST	ME
Tindall-Ford, Chandler, & Sweller (1997)	RS7	ME
Yeung, Jin, & Sweller (1997)	RS9	ME
de Croock, van Merriënboer, & Paas (1998)	RS9	
Kalyuga, Chandler, & Sweller (1998)	RS7	ME
Kalyuga, Chandler, & Sweller (1999)	RS7	ME
Tuovinen & Sweller (1999)	RS9	ME
Yeung (1999)	RS9	ME
Kalyuga, Chandler, & Sweller (2000)	RS7	ME
Kalyuga, Chandler, & Sweller (2001)	RS7	ME
Kalyuga, Chandler, Tuovinen, & Sweller (2001)	RS9	ME
Mayer & Chandler (2001)	RS7	
Pollock, Chandler, & Sweller (2002)	RS7	ME
Stark, Mandl, Gruber, & Renkl (2002)	RS9	
Tabbers, Martens, & van Merriënboer (2002)	RS9	
Tabbers, Martens, & van Merriënboer (in press)	RS9	
Van Gerven, Paas, van Merriënboer, Hendriks, & Schmidt (2002)	RS9	ME
Van Gerven, Paas, van Merriënboer, & Schmidt (2002a)	RS9	ME
Van Gerven, Paas, van Merriënboer, & Schmidt (2002b)	PR	
Van Gerven, Paas, van Merriënboer, & Schmidt (2002c)	RS9, ST	ME
van Merriënboer, Schuurman, de Croock, & Paas (2002)	RS9	ME

Note. Studies are listed in chronological order. PS = production system; ST = secondary task technique; RS = rating scale (9-point or 7-point scale); ME = mental efficiency; HRV = heart rate variability; PR = pupillary responses.

The efficiency of the learning environment is measured by the method of Paas and van Merrienboer by employing the formula in figure 4. Under this formula, the E value represents the efficiency of the learning environment. √2 comes from the ax+by+c=0, which is the formula for the measurement of the distance between two points. The evaluation of the results measured under the formula of figure 4 is made by the table in figure 5. To give an example, if the measured E value corresponds to the area marked by A, the efficiency of the environment is high. In contrast, if the result is in the area marked C, the performance is low, even though the mental effort is high. Finally, if the measured E value is 0, that means, the mental effort and performance is in equilibrium.

$$E = \frac{z_{Performance} - z_{Mental\ Effort}}{\sqrt{2}}$$

Figure 2.4: The formula of Efficiency

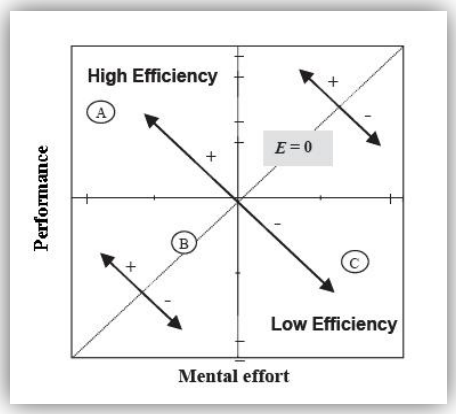

Figure 2.5: Graph of Efficiency

As mentioned earlier, because this method developed by Paas and Merrienboer integrates mental effort and performance, it is the most efficient and valuable method employed to measure cognitive load. In this regard, while measuring the environmental efficiency of the History of Civilization class, which constitutes the rest and the main analysis of this thesis, the formula given under figure 4 will be used, and the result will be interpreted in the light of the efficiency table given under figure 5.

3. MATERIALS & METHODS

In this part of the research, the History of Civilization class in Bahcesehir University, Faculty of Engineering will be taken as an example for measuring the efficiency of the learning environment with Paas and Merrienboer's method of measurement. Under the aforementioned class, which lasts 14 weeks and is based on movie screening every 2 weeks, in order to evaluate the efficiency of the learning environment and the overall success of the class, students were asked to participate in quizzes with 10 questions and to rank the difficulty of that questions. A total of 7 quizzes were made during the semester. Students had 15 minutes for the quizzes, which corresponds to 1, 5 minutes of time for each question. Within 15 minutes time period, students both answered the questions and ranked the difficulty of them, ranking from 1 to 5. 1 corresponds to the easiest, where 5 correspond to the most difficult question. History of Civilization class operated through 4 sections in 2008-2009 spring semester. The attendance to sections and quizzes could differ from one week to another. Table 2 shows the number of students attended to sections and quizzes through the whole semester.

Table 3.1: Number of Students that attended to the lectures.

		MOVIES						
		Hannibal	Maya	Columbus	Colonial America	Islam	Galileo	Newton
SECTIONS	Sec. 5	49	56	36	52	36	68	72
	Sec. 6	54	50	31	22	25	47	53
	Sec. 7	68	54	57	46	13	53	42
	Sec. 8	77	53	44	58	19	54	36

In the second part of the research, data about the questions and their degree of difficulty was collected and transformed into z-performance and z-mental effort scores, as well as the scores of efficiency.

While calculating z-performance scores, the total of correct answers of the students in every quiz were divided to the total number of quizzes. Z-mental effort, on the other

hand was calculated in the light of the data on the difficulty levels of the questions. Based on these two data sets, efficiency was calculated through the formula given under figure 4. Figure 6 shows the efficiency calculation of twenty randomly-selected students from the class in quiz 1;

Table 3.2: Efficiency calculation of twenty randomly-selected students from all sections.

Ogrenci	Test 1 Puan	Test 1 Sure	Test 1 Zorluk	Performance	Z Score for Performance	Z Score for Mental Effort	(E) Efficiency	Efficiency Status of Student
1	20	10	1	2	-1,065649763	-1,383117384	0,224483508	High
2	56	10	5	5,6	0,241450457	1,251391919	-0,714136456	Low
3	22	10	4	2,2	-0,993033084	0,592764593	-1,121328291	Low
4	54	10	5	5,4	0,168833778	1,251391919	-0,765484202	Low
5	45	10	1	4,5	-0,157941277	-1,383117384	0,866330334	High
6	67	10	2	6,7	0,640842191	-0,724490058	0,965435692	High
7	89	10	3	8,9	1,439625659	-0,065862733	1,064541051	High
8	57	10	3	5,7	0,277758797	-0,065862733	0,242977114	High
9	99	10	4	9,9	1,802709053	0,592764593	0,855559933	High
10	34	10	5	3,4	-0,55733301	1,251391919	-1,278961663	Low
11	54	10	5	5,4	0,168833778	1,251391919	-0,765484202	Low
12	87	10	4	8,7	1,36700898	0,592764593	0,547473456	High
13	87	10	3	8,7	1,36700898	-0,065862733	1,013193305	High
14	43	10	2	4,3	-0,230557955	-0,724490058	0,349262739	High
15	23	10	2	2,3	-0,956724744	-0,724490058	-0,164214721	Low
16	57	10	1	5,7	0,277758797	-1,383117384	1,17441681	High
17	22	10	4	2,2	-0,993033084	0,592764593	-1,121328291	Low
18	3	10	5	0,3	-1,682891533	1,251391919	-2,074851727	Low
19	11	10	2	1,1	-1,392424818	-0,724490058	-0,472301198	Low
20	57	10	1	5,7	0,277758797	-1,383117384	1,17441681	High
		Performance	Mental Effort					
	Mean	4,935	3,1					
	STD	2,754188198	1,518309309					

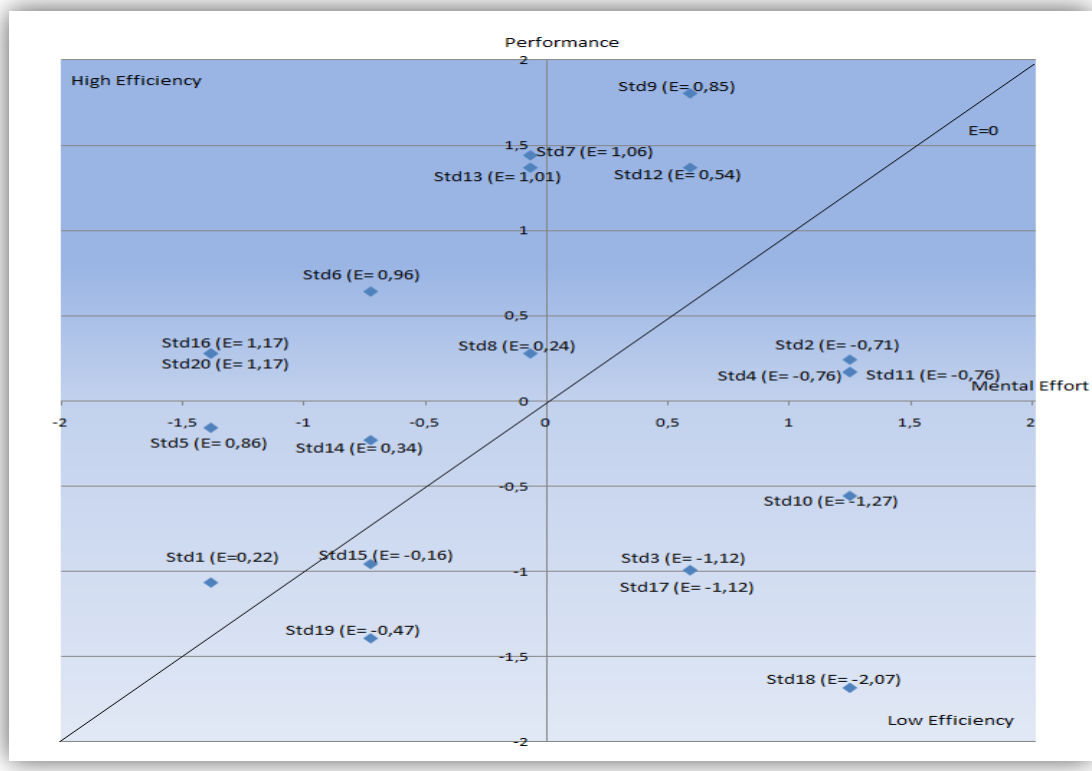

Figure 3.1: Efficiency Graph of Table 3.

As number of students that attend to the classes differs from one week to another, a group of 36 students who attended to all quizzes and all lectures were selected for the interpretation of the overall learning environment of the History of Civilizations course. Due to ethical reasons and privacy of the students, the students are enumerated from 1 to 36. Their faculties, gender and sections are shown below in Fig.7.

Table 3.3: Faculties, gender and sections of the 36 students.

Student	Gender	Section	Faculty
std1	M	5	Arts&Sci
std2	F	5	Arts&Sci
std3	F	5	Arts&Sci
std4	F	5	Arts&Sci
std5	F	5	Arts&Sci
std6	F	5	Arts&Sci
std7	M	5	Arts&Sci
std8	F	5	Arts&Sci
std9	F	5	Arts&Sci
std10	M	5	Arts&Sci
std11	M	5	Arts&Sci
std12	F	5	Arts&Sci
std13	M	5	Arts&Sci
std14	F	5	Arts&Sci
std15	F	5	Arts&Sci
std16	M	6	Eng
std17	M	6	Eng
std18	M	6	Eng
std19	F	6	Eng
std20	M	6	Eng
std21	F	6	Eng
std22	M	6	Eng
std23	M	7	Eng
std24	F	7	Eng
std25	M	7	Eng
std26	F	7	Eng
std27	F	7	Eng
std28	M	7	Eng
std29	M	8	Eng
std30	M	8	Eng
std31	M	8	Eng
std32	M	8	Eng
std33	M	8	Eng
std34	M	8	Eng
std35	M	8	Eng
std36	M	8	Eng

Finally, based on the calculated performances and mental efforts of selected 36 students, the efficiency of the learning environment of the History of Civilizations course on students was interpreted through the table in figure 5 under five headings; section-based efficiency of opposite sexes, film-based efficiency of different faculties,

section-based efficiency of different films, film-based efficiency of opposite sexes, and finally, film-based efficiency of different sections. The achieved results under each heading were also cross-checked by using ANOVA test method of SPSS tool[2].

[2] For more information about SPSS and ANOVA test method, see appendix (B)

4. FINDINGS

4.1. SECTION-BASED EFFICIENCY OF OPPOSITE GENDERS

When we take a look at section-based efficiency of male and female students, we see highly diverse results.

In section 5, we are faced with low efficiency in both of the sexes. Numeratically, 3 of the 5 males that were taking History of Civilizations class in section 5 showed low efficiency. Similarly, 8 of the 10 female students responded the class with low efficiency. So, it can be argued that the efficiency of the learning environment of section 5 is very low for the majority of the students- regardless of their genders.

Section 6 shows a different picture than section 5. When we take a look at the female population the class, we see that both girls were highly efficient, whereas majority of the male population was faced with low efficient learning environment. In other words, learning environment of section 6 was more efficient for female students than for male students.

Whereas section 6 was offering a more favorable learning environment for female students and less favorable for male students, section 7 offers just the opposite. In section 7, 2 of the 3 male students showed high efficiency, where 2 of the 3 female population of the class were faced with low efficient environment for learning.

Finally, in section 8, we are faced with low efficient learning environment for male students, as for 5 of the 8 male population; efficiency of the learning environment was low. As section 8 was only made up of male students, we cannot analyze the efficiency for female students.

4.2. FILM-BASED EFFICIENCY OF OPPOSITE GENDERS

When we take a look at the efficiency for different genders in seven different films, we are commonly faced with opposite efficiency statuses for male and female students. While male and female population showed parallel efficiency levels in three films (Islam, Maya and Colonial America), the results are highly different for the rest.

In Maya, which is the movie that was shown in 4th week, we see that efficiency of the learning environment was low for majority of the students, regardless of their sexes. Only 33.3 percent of the female population showed high efficiency, whereas this number decreased to 28.5 percent among male population.

The same results were also determined by the ANOVA test. As the calculated value of significance by the ANOVA method is greater than 0.05, it is proven that genders of the participants of the week 4 are not important in determining the efficiency of the learning environment of the class in question.

Table 4.1: SPSS tool ANOVA test result of the movie Maya for Gender variable.

Dependent	Variable	Sum of Squares	df	Mean Square	F	Sig.
Gender	Between Groups	,375	1	,375	1,536	,218
	Within Groups	25,875	106	,244		
	Total	26,250	107			

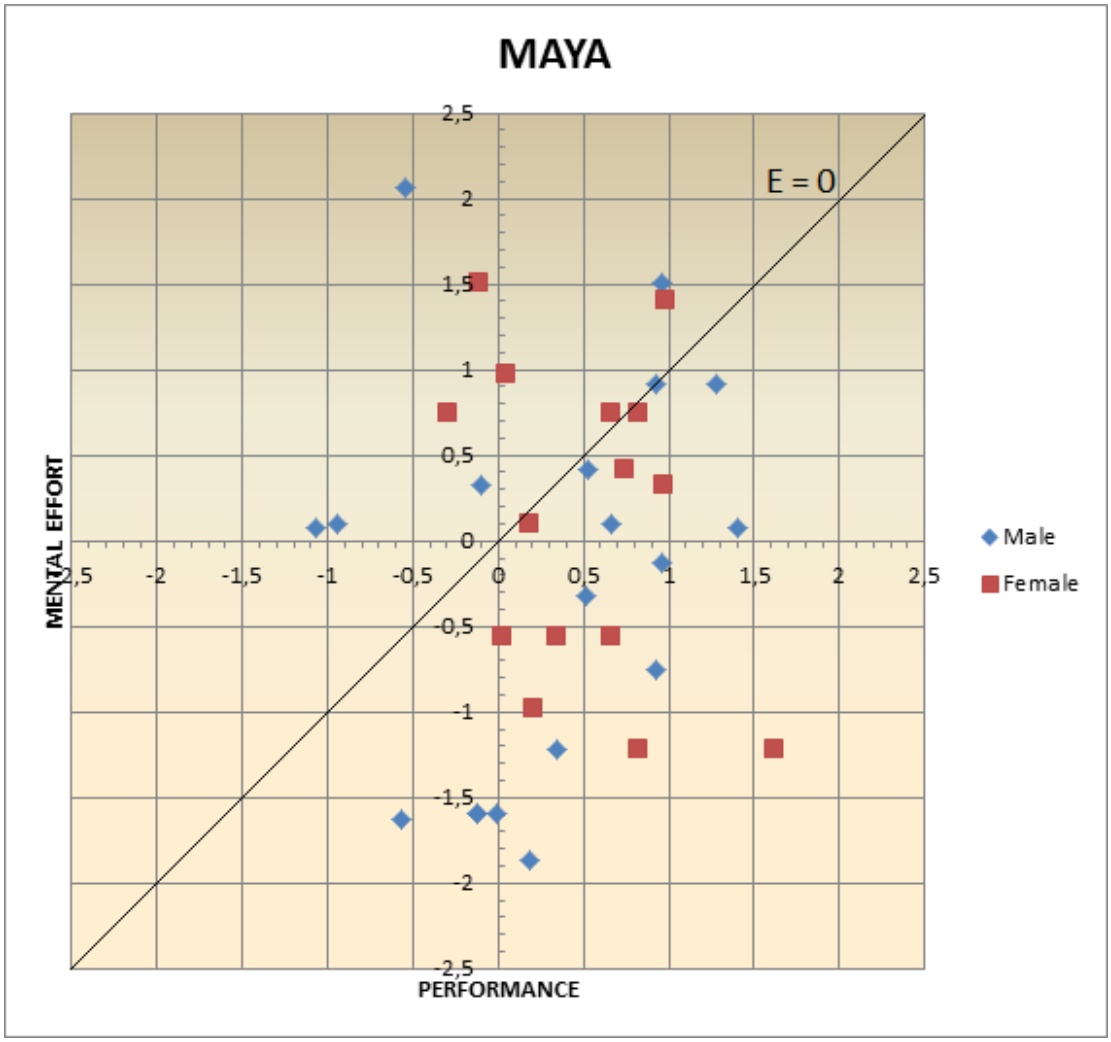

Figure 4.1: Distribution of Students by Genders on Efficiency Graph for the movie Maya.

Like Maya, learning environment for the movie Colonial America was inefficient for most of the students. 10 of the 15 female students experienced low efficiency in the week concerned. The number was 14 to 21 among male population. Thus, supported by the findings of the ANOVA test, we can argue that week 4 and week 6 of the History of the Civilization class provided the least efficient learning environment for both male and female participants.

Table 4.2: SPSS tool ANOVA test result of the movie Colonial America for Gender variable.

Dependent	Variable	Sum of Squares	df	Mean Square	F	Sig.
Gender	Between Groups	,068	1	,068	,276	,600
	Within Groups	26,182	106	,247		
	Total	26,250	107			

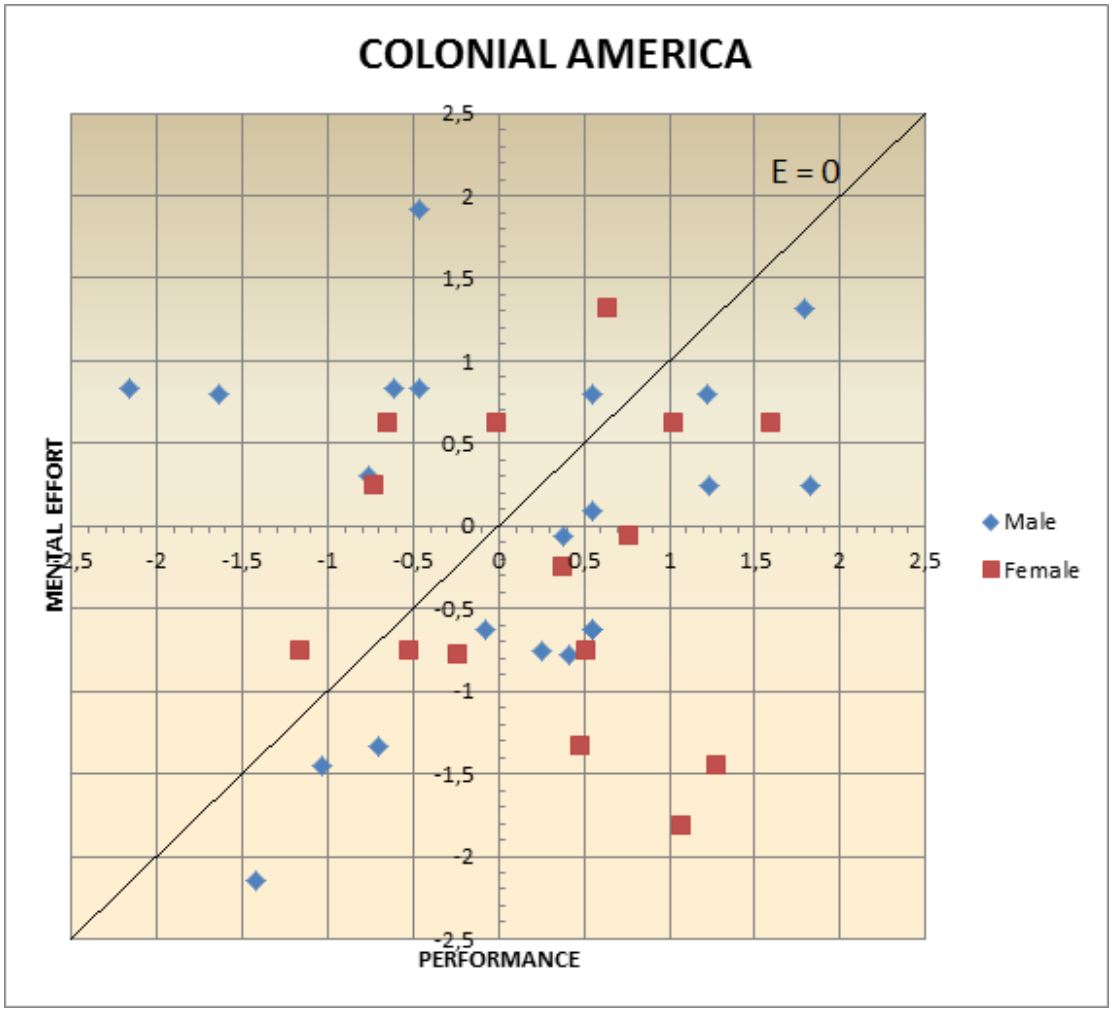

Figure 4.2: Distribution of Students by Genders on Efficiency Graph for the movie Colonial America.

Majority of both male and female students were again faced with inefficient learning environment for the class was week 7, where the movie "Islam" was shown. In that

week's lecture, only 7 of the 15 female students, and 9 of the 21 male students were responded with high efficiency.

Again, in line with the efficiency statuses of the students, ANOVA test proved that gender is not a significant variable fort he efficiency of the learning environment of the week concerned. Table 7 illustrates this point:

Table 4.3: SPSS tool ANOVA test result of the movie Islam for Gender variable.

Dependent	Variable	Sum of Squares	df	Mean Square	F	Sig.
Gender	Between Groups	,002	1	,002	,009	,923
	Within Groups	26,248	106	,248		
	Total	26,250	107			

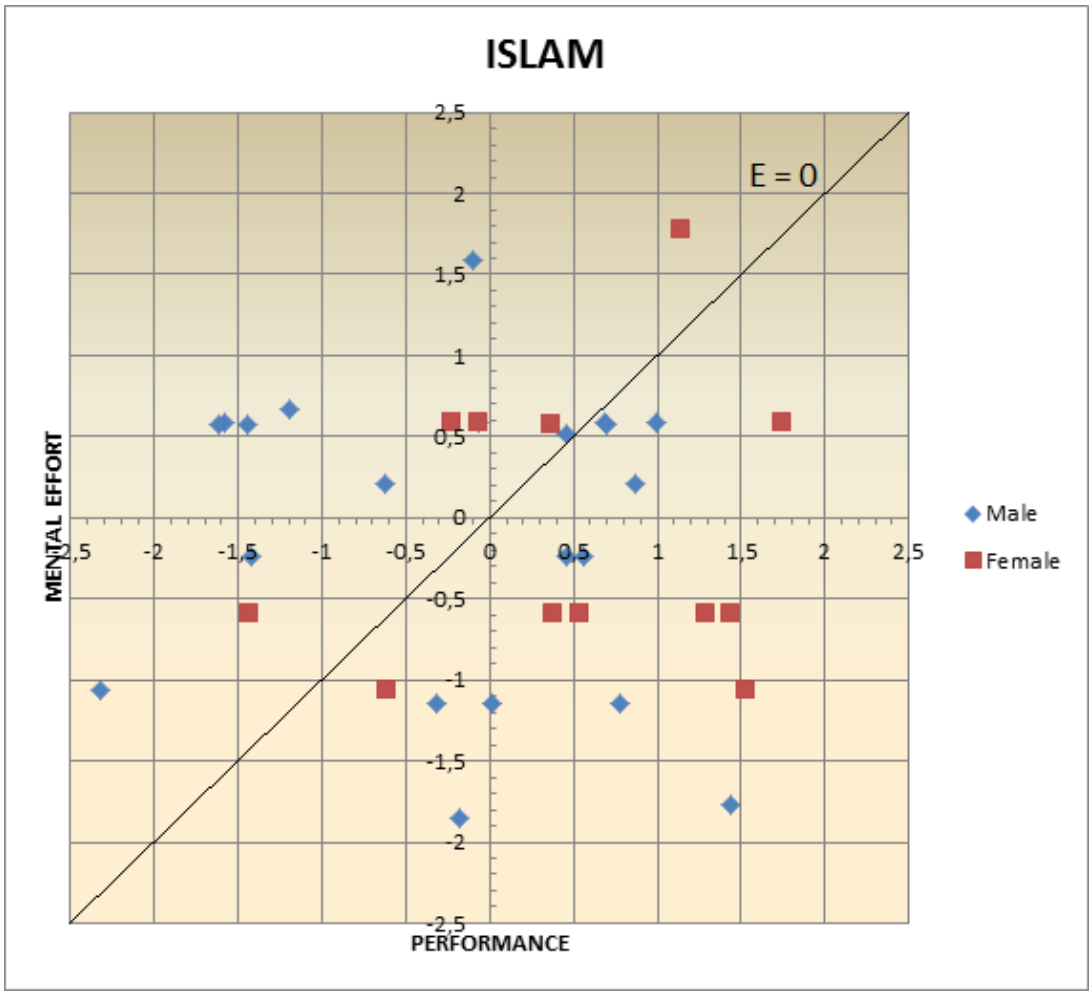

Figure 4.3: Distribution of Students by Genders on Efficiency Graph for the movie Islam.

In weeks where the movies Hannibal, Columbus, Galileo and Newton were screened, differences in sexes were also reflected in the efficiency statuses of the male and female students. For example, in terms of the movie Columbus, majority of the female participants (10 of the 15) were low, where majority of the male participants (13 of the 21) were high in efficiency.

The significance of the genders of the students fort he movie Columbus is also reflected in the results of the ANOVA test. As the value of significance is smaller than 0.05, it is verified that genders play an important role in the efficiency of the learning environment of week 5.

Table 4.4: SPSS tool ANOVA test result of the movie Columbus for Gender variable.

Dependent	Variable	Sum of Squares	df	Mean Square	F	Sig.
Gender	Between Groups	2,083	1	2,083	9,138	,003
	Within Groups	24,167	106	,228		
	Total	26,250	107			

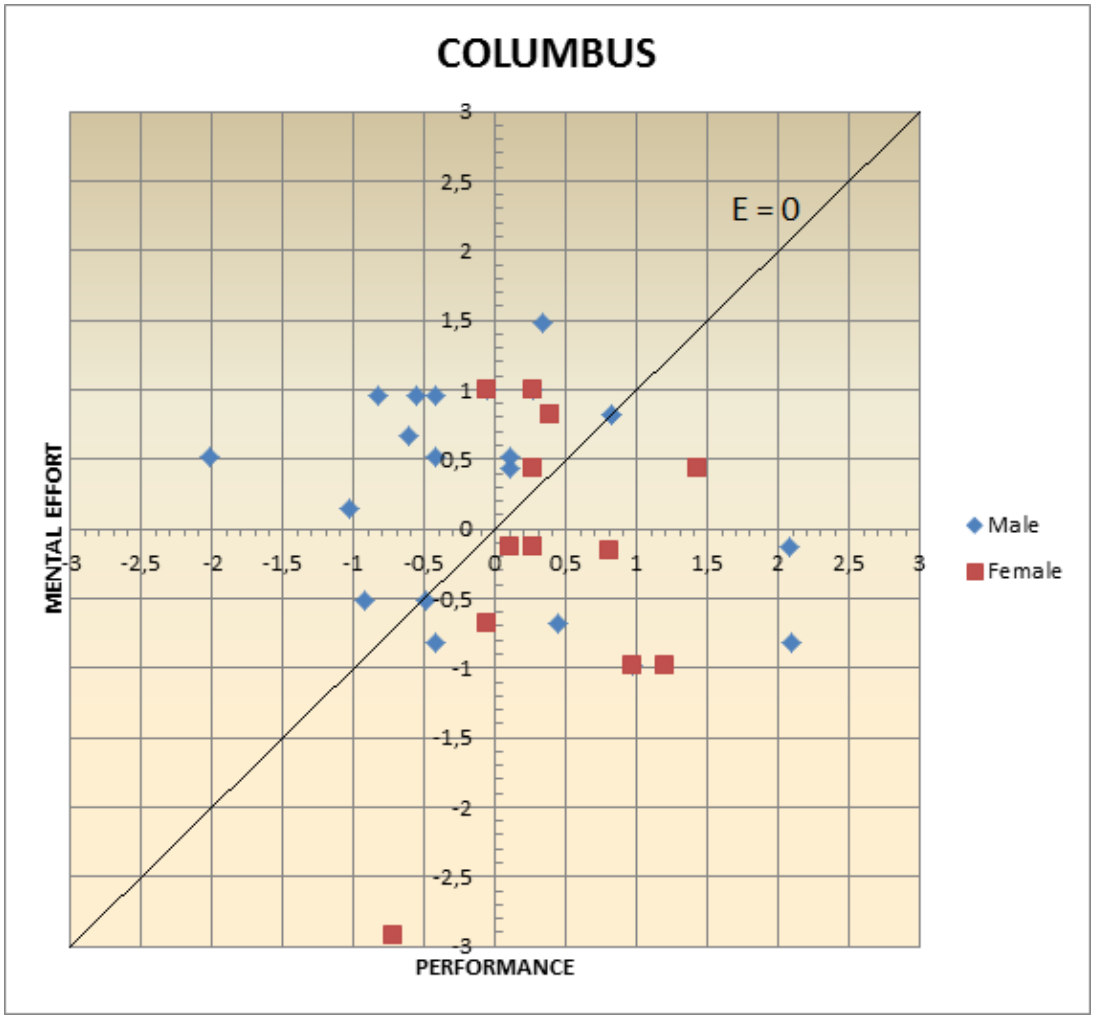

Figure 4.4: Distribution of Students by Genders on Efficiency Graph for the movie Columbus.

The same result was also received in the week of Galileo (8 of the 15 female students and 9 of the 21 male students responded with low efficiency) and in the week of Newton (10 of the 15 female students, 9 of the 21 male students responded with low efficiency).

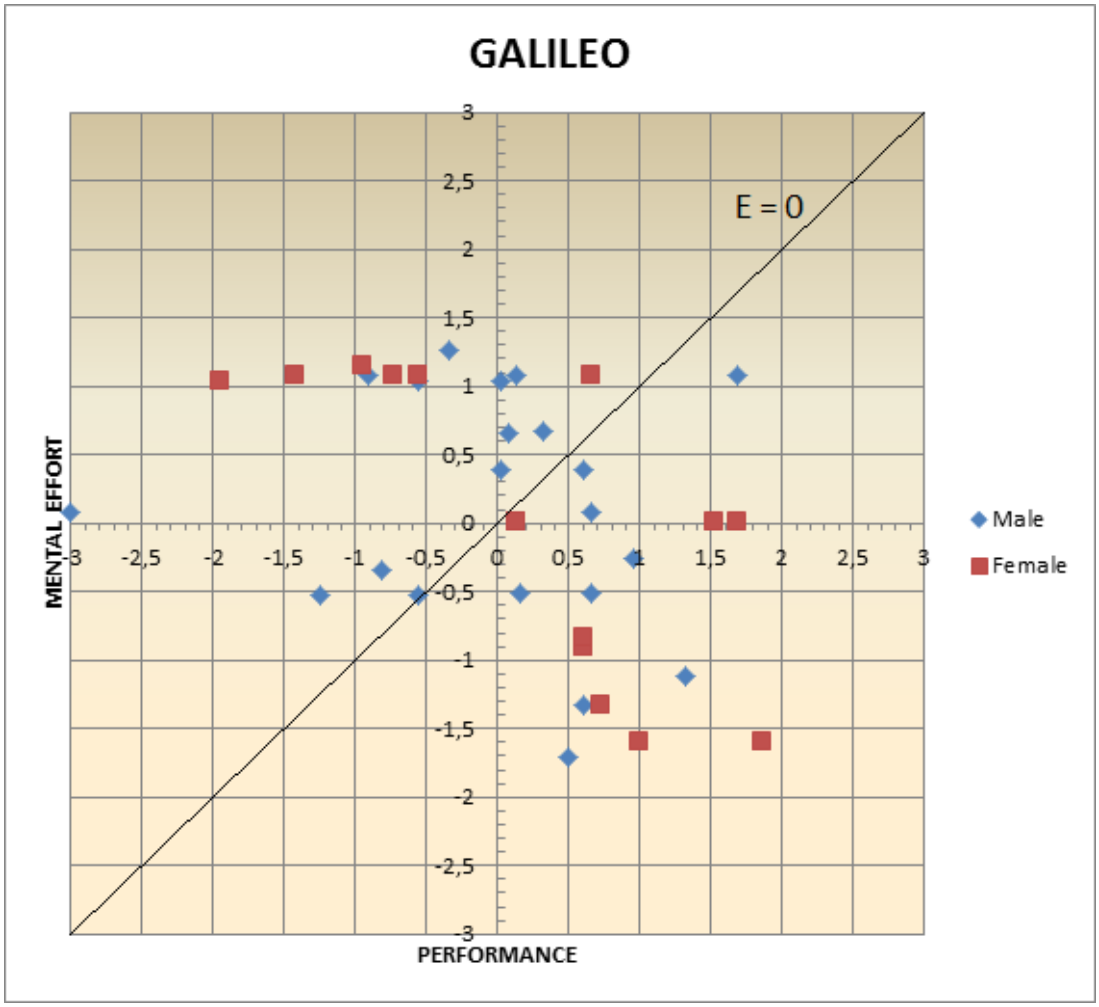

Figure 4.5: Distribution of Students by Genders on Efficiency Graph for the movie Galileo.

Although there were efficiency differences between male and female participants of the weeks where Galileo and Newton were screened, results of the ANOVA test demonstrate that gender is not a significant variable for those weeks in question;

Table 4.5: SPSS tool ANOVA test result of the movie Galileo for Gender variable.

Dependent	Variable	Sum of Squares	df	Mean Square	F	Sig.
Gender	Between Groups	,281	1	,281	1,147	,287
	Within Groups	25,969	106	,245		
	Total	26,250	107			

Table 4.6: SPSS tool ANOVA test result of the movie Newton for Gender variable.

Dependent	Variable	Sum of Squares	df	Mean Square	F	Sig.
Gender	Between Groups	,244	1	,244	,993	,321
	Within Groups	26,006	106	,245		
	Total	26,250	107			

These results are highly plausible as the efficiency statuses of opposite genders in the weeks of Galileo and Newton are extremely close to each other.

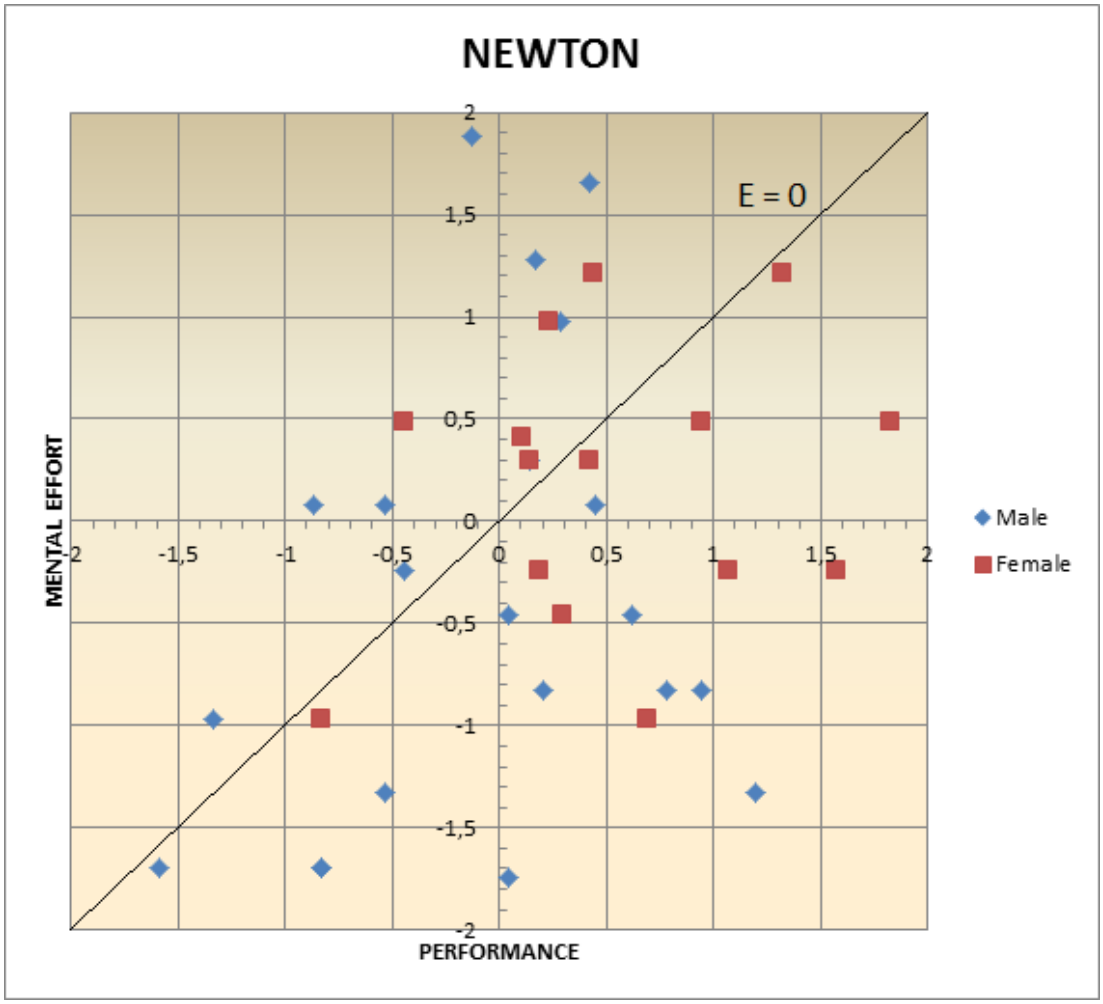

Figure 4.6: Distribution of Students by Genders on Efficiency Graph for the movie Newton.

The only movie where the efficiency of the learning environment was higher for female students when compared to male students was the week of Hannibal. In that week's lecture, 60 percent of the female students showed high efficiency, where this number was decreased to 38.09 percent for male population. The results of the ANOVA test also illustrated the significance of gender differences in determining the efficiency of the learning environment of the week 1.

Table 4.7: SPSS tool ANOVA test result of the movie Hannibal for Gender variable.

Dependent	Variable	Sum of Squares	df	Mean Square	F	Sig.
Gender	Between Groups	1,228	1	1,228	5,204	,025
	Within Groups	25,022	106	,236		
	Total	26,250	107			

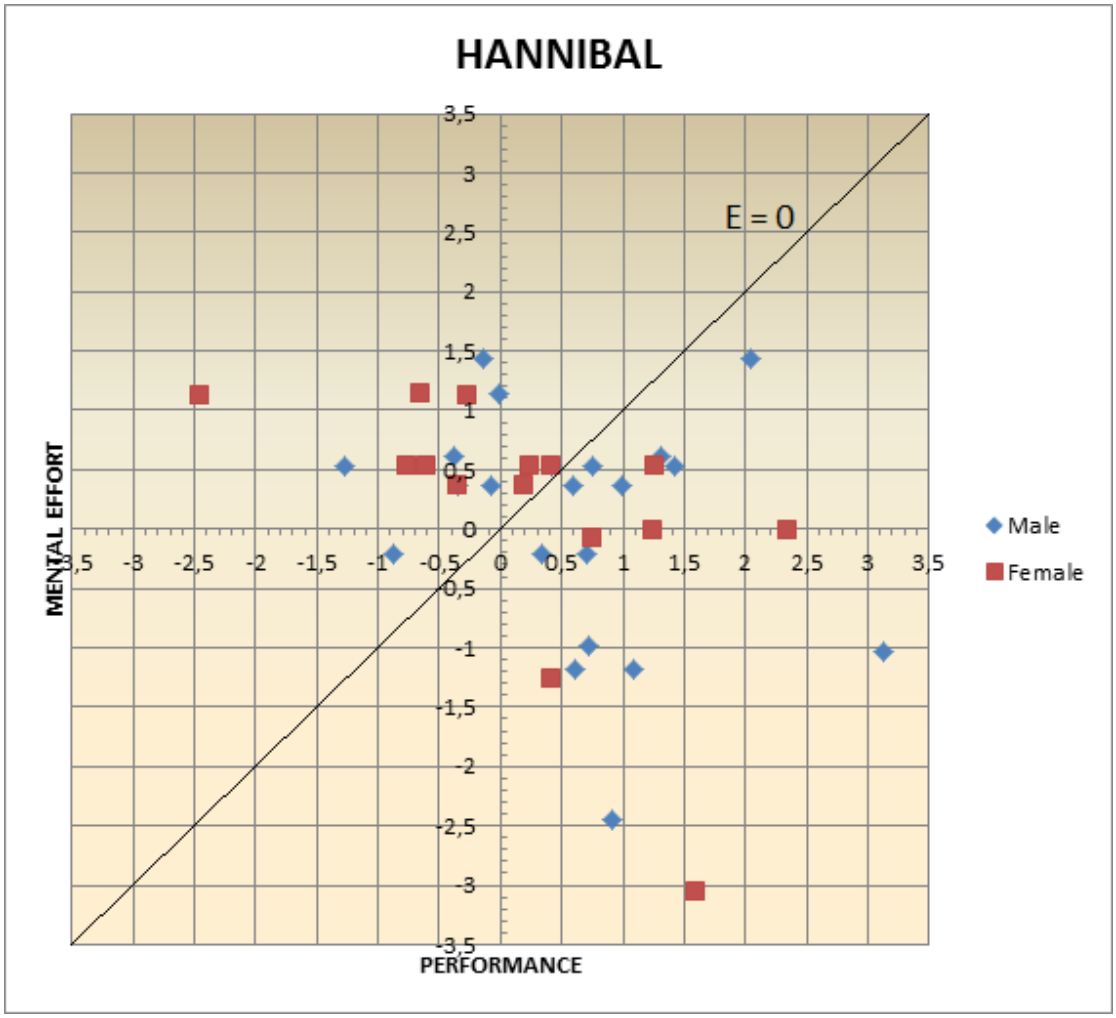

Figure 4.7: Distribution of Students by Genders on Efficiency Graph for the movie Hannibal.

Overall, when we compare the film-based efficiency of the opposite sexes, we see that the efficiency of the learning environment was low for majority of the female students, whereas the learning environment was relatively more efficient for male participants.

4.3. FILM-BASED EFFICIENCY OF DIFFERENT SCHOOLS

The film-based efficiency analysis of different schools shows that, for majority of the films, efficiency statuses show parallel results; and for majority of the students that are both from School of Engineering and School of Arts and Sciences, the environment that films were shown was low in efficiency.

In the week where the movie Maya was screened, both faculties revealed very low efficient statuses. In School of Arts and Sciences, 10 of the 15 students showed low efficiency, and only 7 of the 21 engineering students performed with high efficiency.

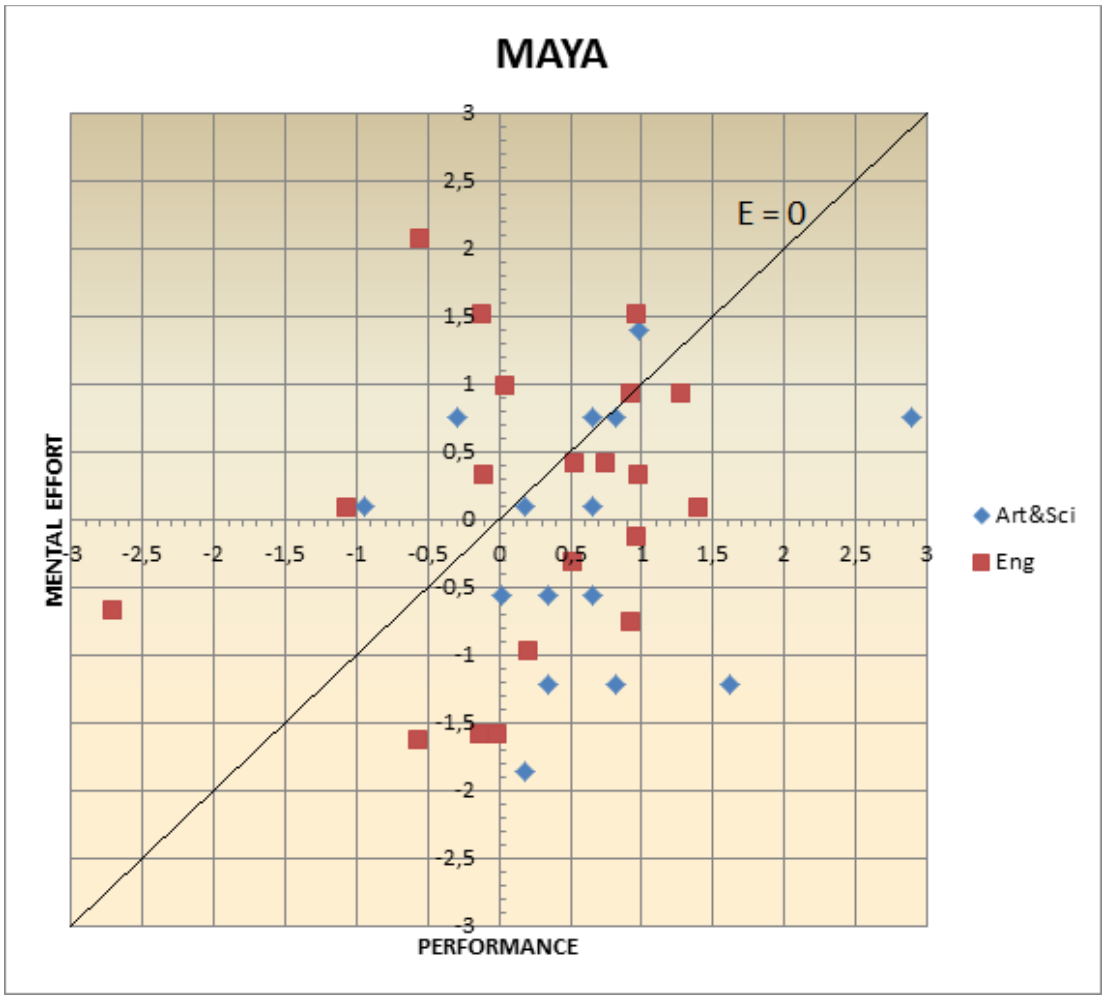

Figure 4.8: Distribution of Students by Schools on Efficiency Graph for the movie Maya.

Thus, as ANOVA results also showed, for Maya, faculties of the participants were not significant enough to affect the efficiency status of the learning environment.

Table 4.8: SPSS tool ANOVA test result of the movie Maya for School variable.

Dependent	Variable	Sum of Squares	df	Mean Square	F	Sig.
School	Between Groups	,000	1	,000	,000	1,000
	Within Groups	26,250	106	,248		
	Total	26,250	107			

The results are similar for the week 5 where Columbus was screened, as well as the week 6 where students watched the movie Colonial America. For the movie Columbus, 60 percent of the Faculty of Arts and Sciences students responded the environment with low efficiency, whereas this number was increased to 61.9 percent among engineering faculty.

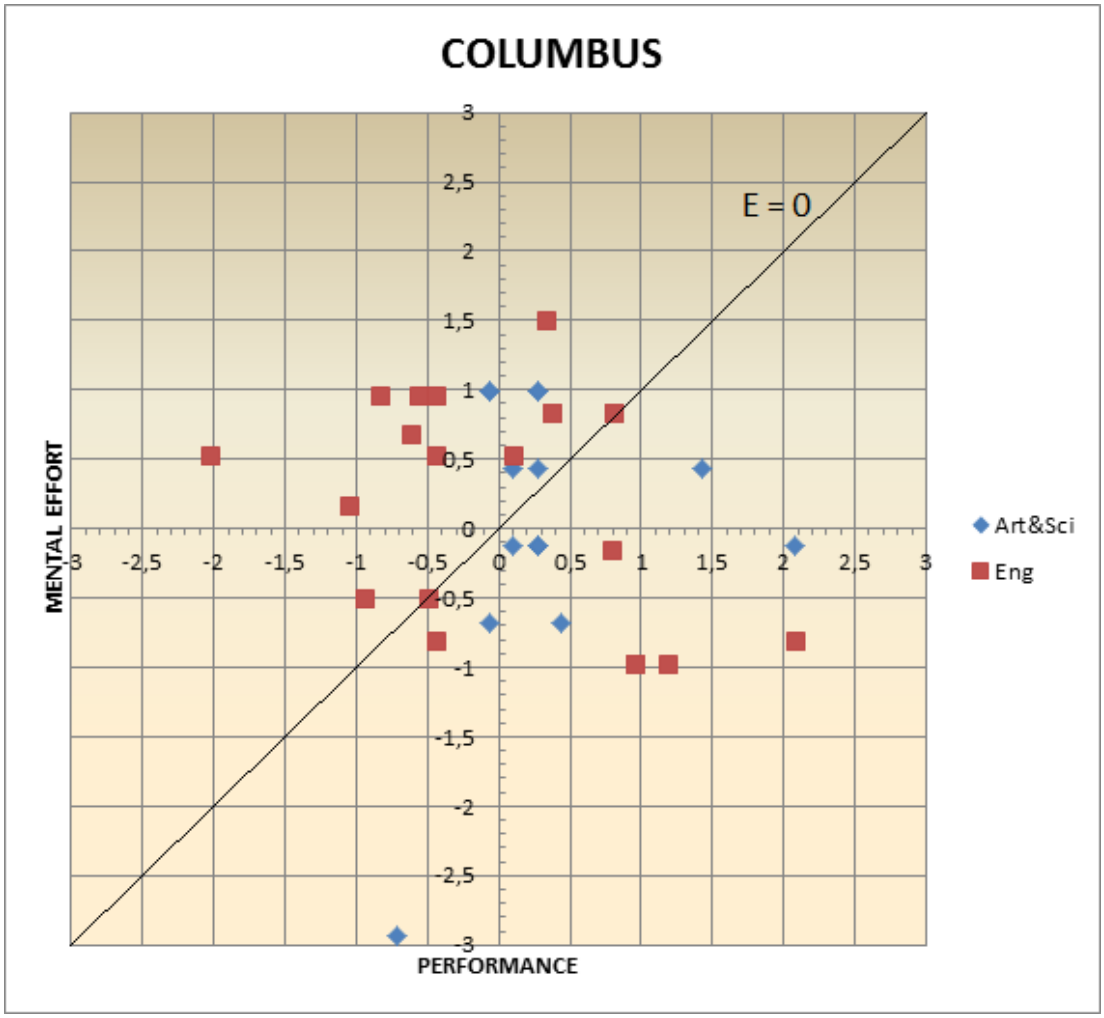

Figure 4.9: Distribution of Students by Schools on Efficiency Graph for the movie Columbus.

The results were even disappointing for the Colonial movie. In the week where Colonial was screened, only 4 of the 15 arts and sciences students, and only 7 of 21 of engineering students showed high efficiency. Thus, as ANOVA results for both movies indicate, faculties of the students were not primary determinants fort he efficiency of the weeks concerned.

Table 4.9: SPSS tool ANOVA test result of the movie Colonial America for School variable.

Dependent	Variable	Sum of Squares	df	Mean Square	F	Sig.
School	Between Groups	,134	1	,134	,542	,463
	Within Groups	26,116	106	,246		
	Total	26,250	107			

Table 4.10: SPSS tool ANOVA test result of the movie Columbus for School variable.

Dependent	Variable	Sum of Squares	df	Mean Square	F	Sig.
School	Between Groups	,750	1	,750	3,118	,080
	Within Groups	25,500	106	,241		
	Total	26,250	107			

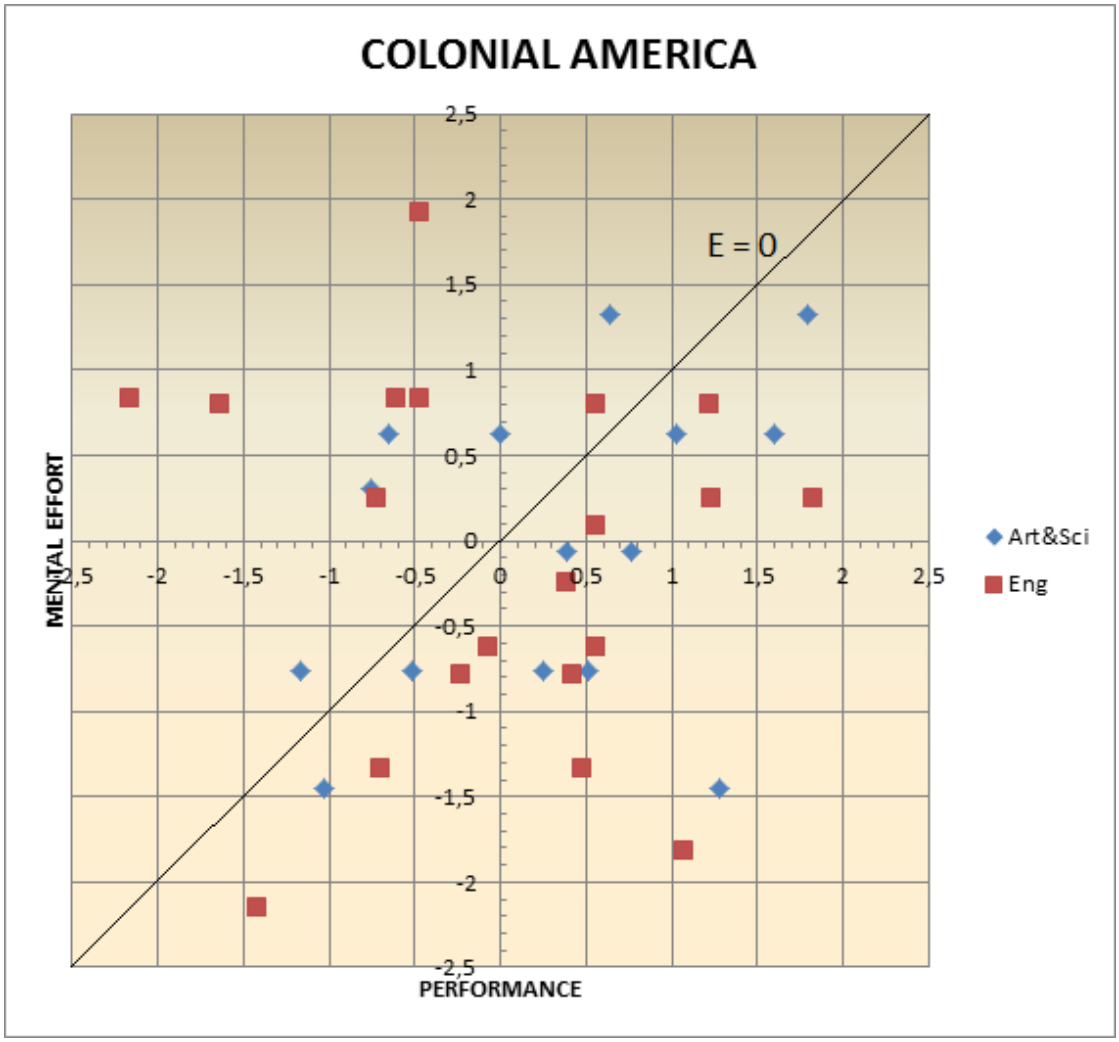

Figure 4.10: Distribution of Students by Schools on Efficiency Graph for the movie Colonial America.

In terms of the rest of the movies, we see that the learning environment was relatively more efficient for the students from School of Arts and Sciences than for engineering students. In Hannibal and Galileo, percentage of arts and sciences students with high efficiency was 53.3 percent and 60 percent respectively. These numbers were reduced to 42.85 percent and 47.6 percent for the students that were coming from the School of Engineering.

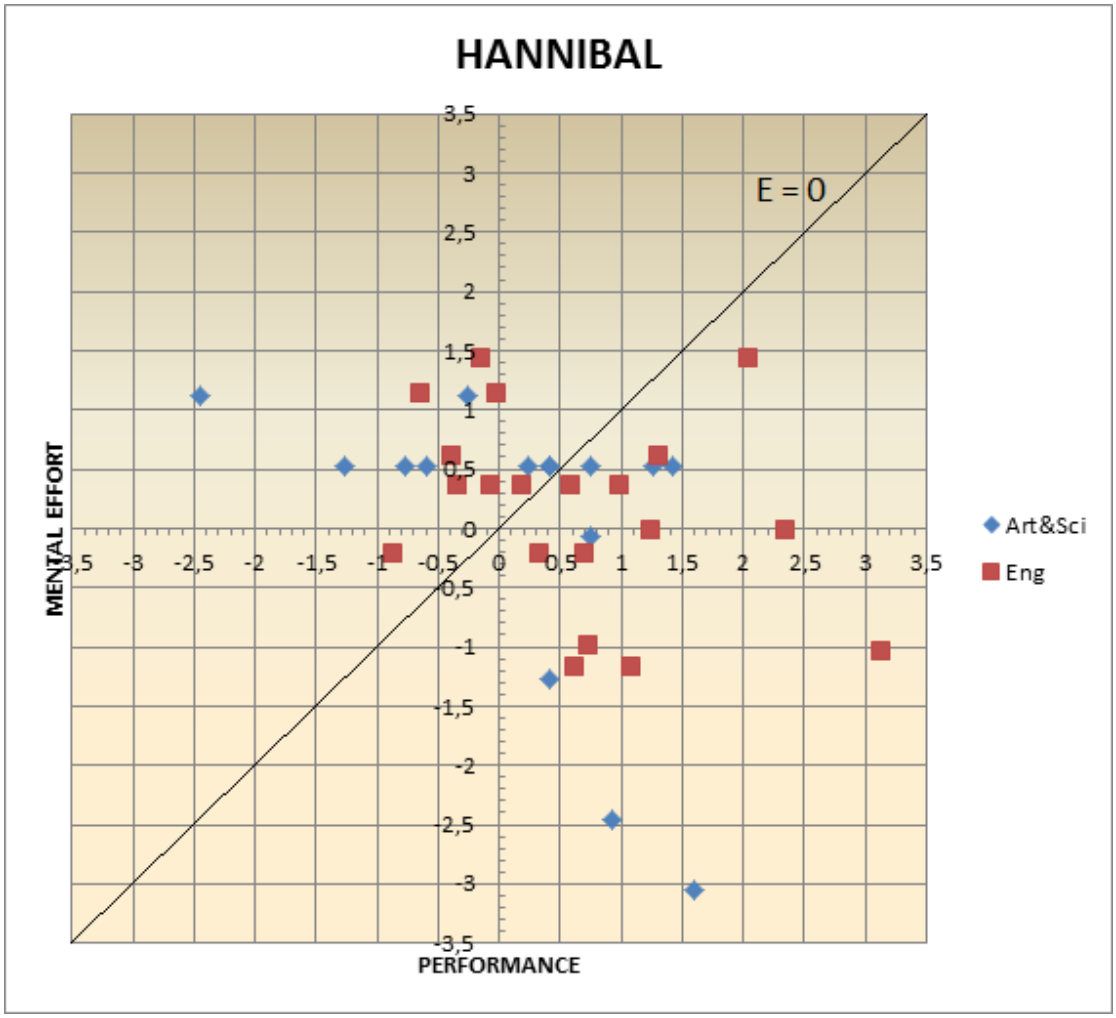

Figure 4.11: Distribution of Students by Schools on Efficiency Graph for the movie Hannibal.

As the results were highly close to each other between students of the Faculty of Arts&Sciences and for the Faculty of Engineering in both of the movies, ANOVA test results indicate that faculties of the participants were not significant in determining the efficiency of the learning environment for the weeks 1 and 9.

Table 4.11: SPSS tool ANOVA test result of the movie Hannibal for School variable.

Dependent	Variable	Sum of Squares	df	Mean Square	F	Sig.
School	Between Groups	,281	1	,281	1,147	,287
	Within Groups	25,969	106	,245		
	Total	26,250	107			

Table 4.12: SPSS tool ANOVA test result of the movie Galileo for School variable.

Dependent	Variable	Sum of Squares	df	Mean Square	F	Sig.
School	Between Groups	,002	1	,002	,009	,923
	Within Groups	26,248	106	,248		
	Total	26,250	107			

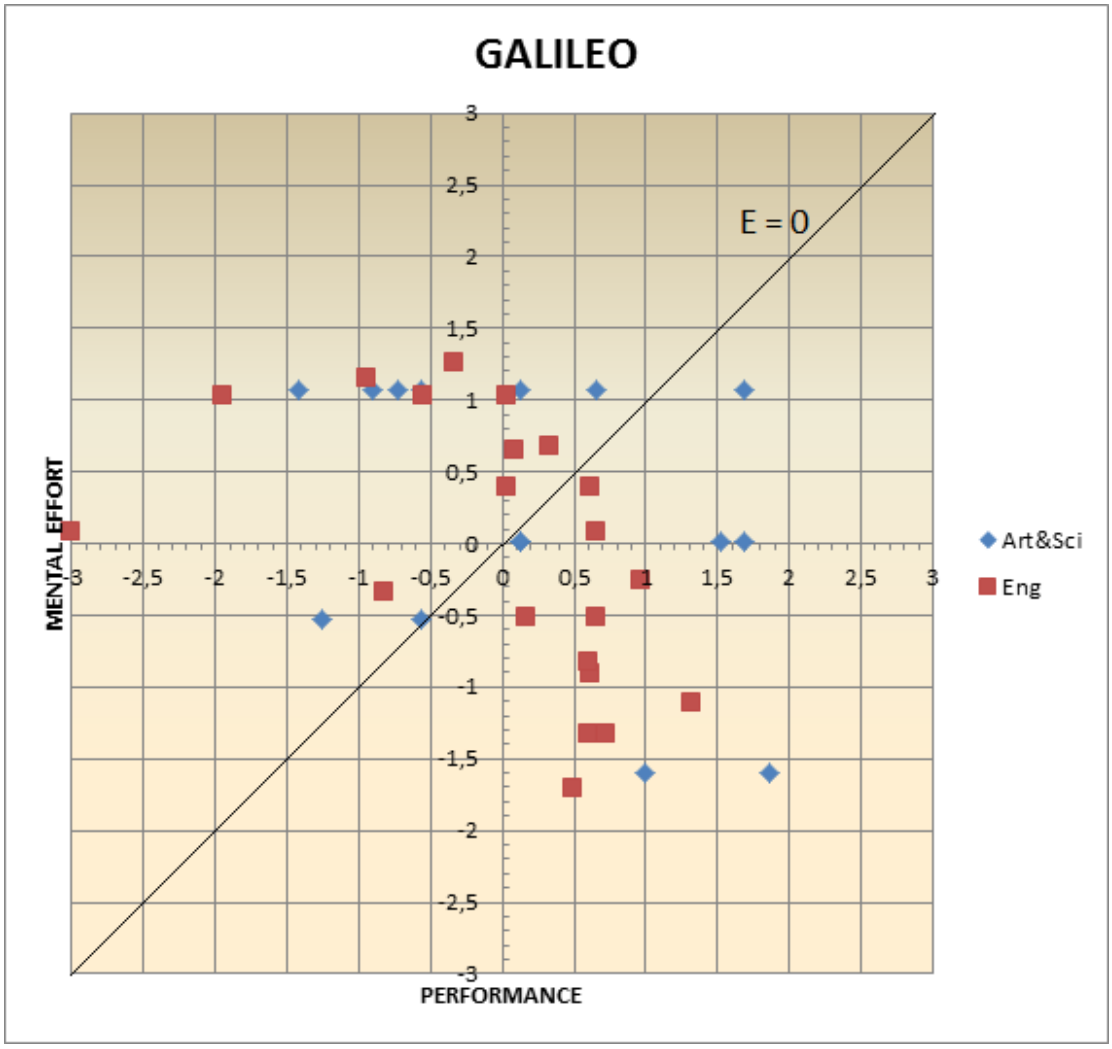

Figure 4.12: Distribution of Students by Schools on Efficiency Graph for the movie Galileo.

The movies Newton and Islam were different in terms of the efficiency of the learning environment for students coming from School of Arts and Sciences and School of Engineering. Newton was different in the sense that it was the only week where

engineering students showed higher efficiency statuses than arts and sciences students. In terms of the week concerned, only 4 of the 15 arts and sciences students showed high efficiency, where this number was increased to 10 of the 21 engineering faculty members.

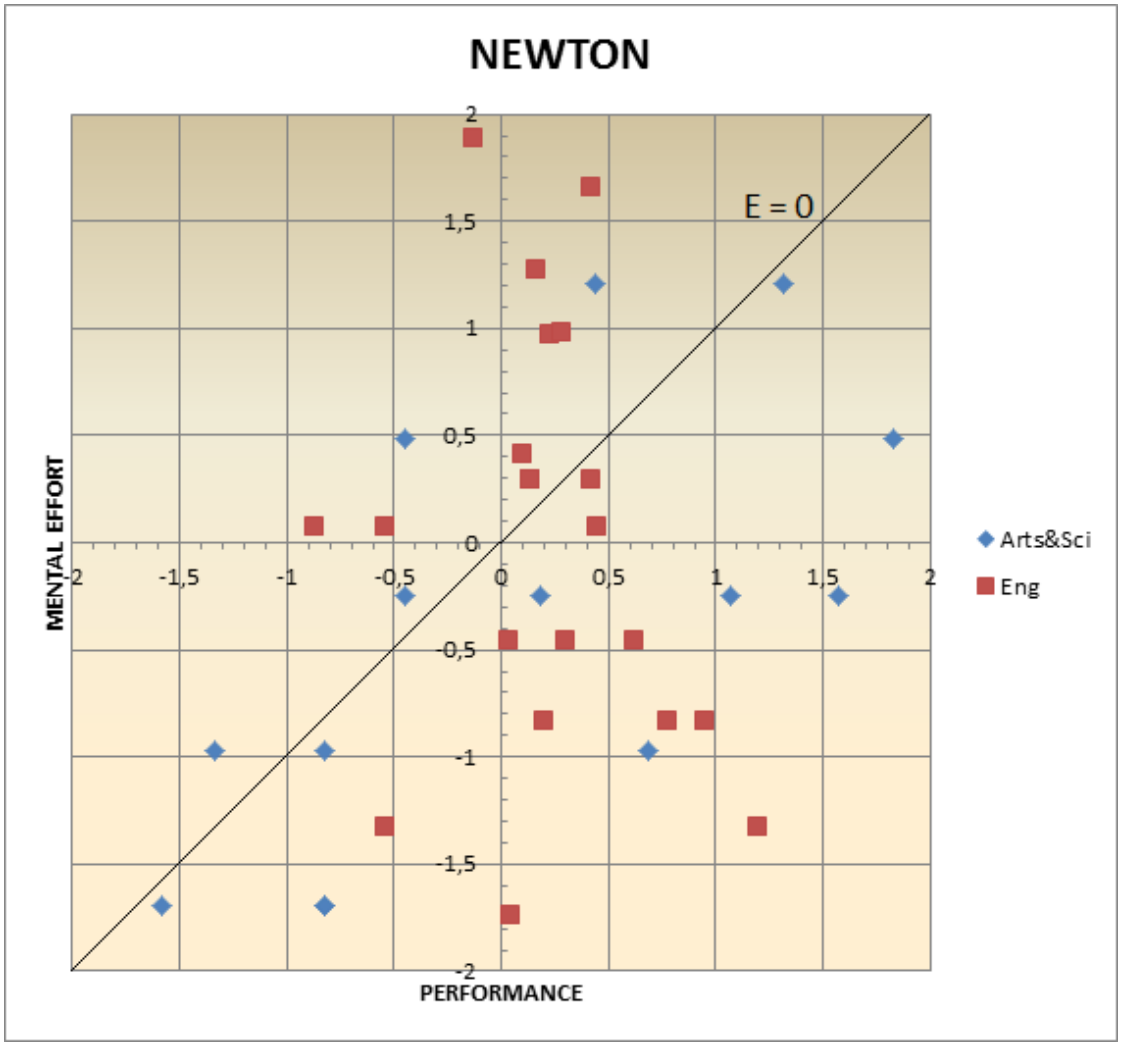

Figure 4.13: Distribution of Students by Schools on Efficiency Graph for the movie Newton.

Finally, as for the movie Islam, learning environment is again inefficient for majority of both School of Arts and Sciences and School of Engineering students was Islam. In this week, 8 of 15 students from arts and sciences faculty, and 11 of 21 students from

engineering faculty revealed low levels of efficiency statuses about the learning environment of the History of Civilizations class.

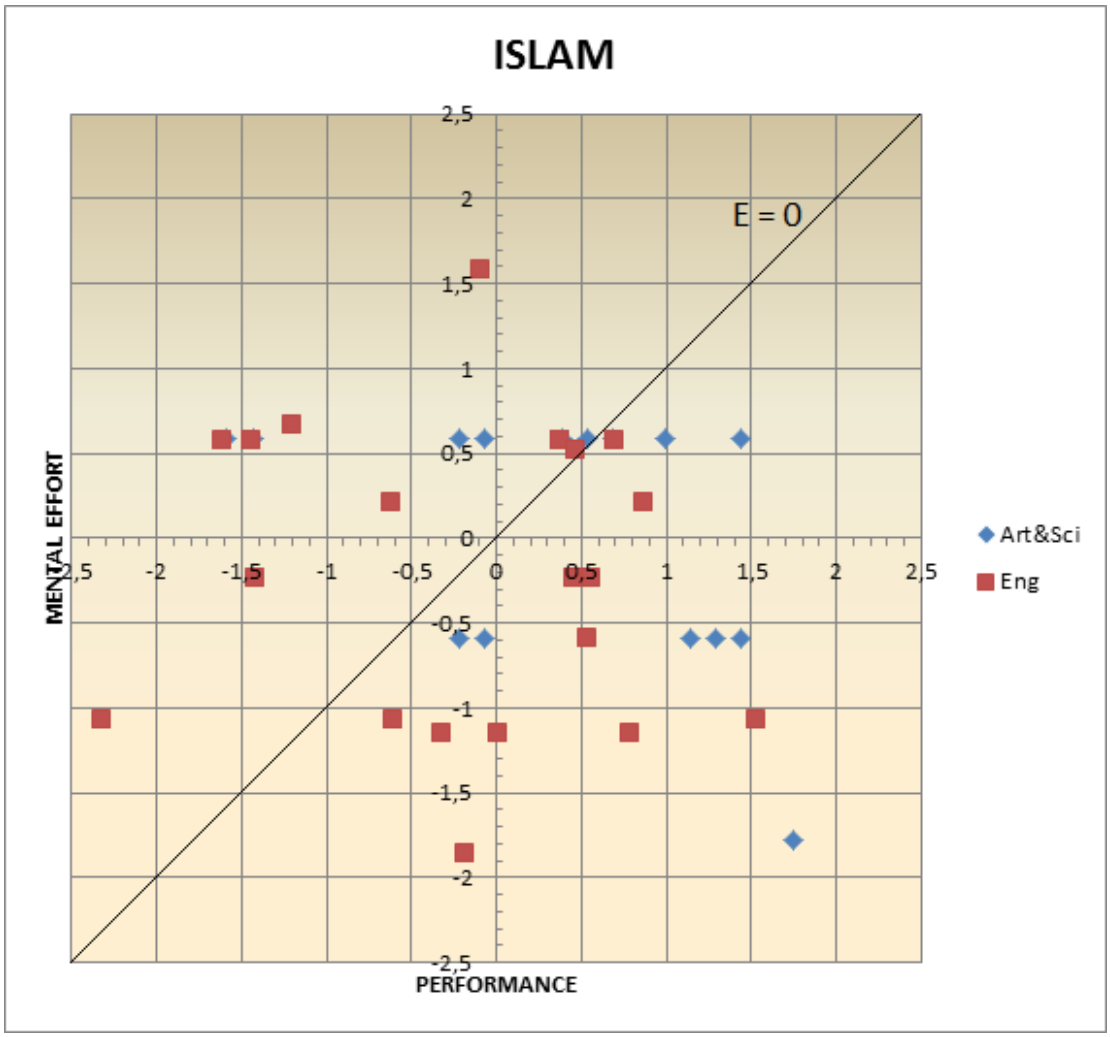

Figure 4.14: Distribution of Students by Schools on Efficiency Graph for the movie Islam.

Results of the ANOVA test also verified that fort he weeks of Newton and Islam, faculties were highly significant in determining the efficiency statuses of the learning environments.

Table 4.13: SPSS tool ANOVA test result of the movie Newton for School variable.

Dependent	Variable	Sum of Squares	df	Mean Square	F	Sig.
School	Between Groups	1,179	1	1,179	4,983	,028
	Within Groups	25,071	106	,237		
	Total	26,250	107			

Table 4.14: SPSS tool ANOVA test result of the movie Islam for School variable.

Dependent	Variable	Sum of Squares	df	Mean Square	F	Sig.
School	Between Groups	,002	1	,002	,009	,923
	Within Groups	26,248	106	,248		
	Total	26,250	107			

4.4. FILM-BASED EFFICIENCY OF DIFFERENT SECTIONS

First week's film, Hannibal, shows parallel results of efficiency between sections 5 and 6, and between sections 7 and 8.

In section 5, there were 7 low and 8 high statuses of efficiency among students. This number was 3 and 4 respectively among seven students that participated the week, under section 6. That means, the week of the movie, Hannibal was a high efficient learning environment both for the students of section 5 and section 6.

Although efficiency was commonly high for sections 5 and 6, the results were not so bright for section 7 and 8. The majority of the students both in sections 7 and 8 revealed low levels of efficiency in Hannibal week. In section 7, only 2 of the 6 students showed high efficiency statuses. Similarly, in section 8, the number of students that revealed high efficiency statuses was only 3 among the total 8.

Thus, in sum, it is plausible to argue that for Hannibal, sections of the participants play a significant role in determining the efficiency of the learning environment. Results of the ANOVA test also verify this point:

Table 4.15: SPSS tool ANOVA test result of the movie Hannibal for Section variable.

Dependent	Variable	Sum of Squares	df	Mean Square	F	Sig.
Section	Between Groups	6,039	1	6,039	4,046	,047
	Within Groups	158,211	106	1,493		
	Total	164,250	107			

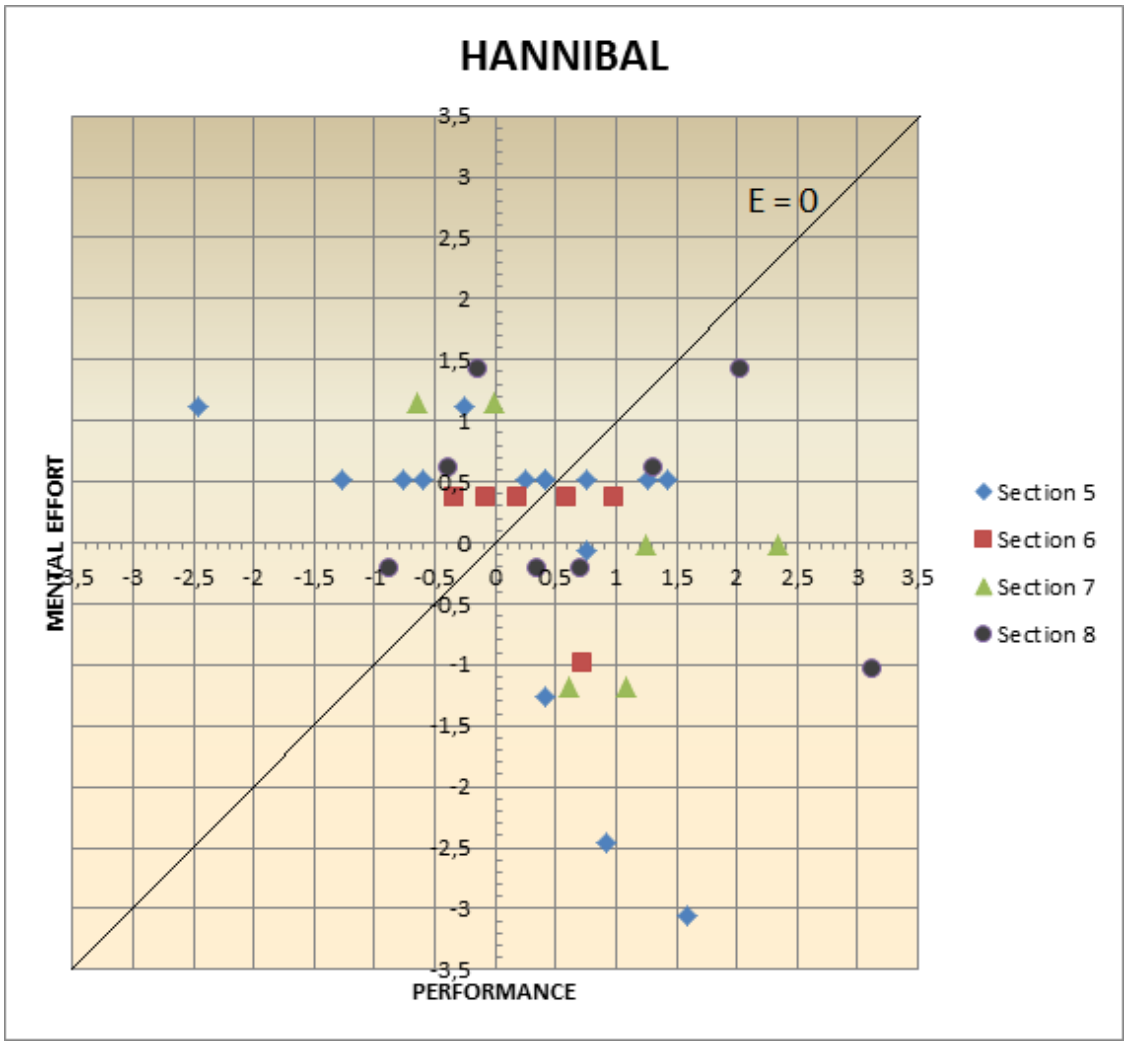

Figure 4.15: Distribution of Students by Sections on Efficiency Graph for the movie Hannibal.

When we take a look at 4th week's film, Maya, we see that the learning environment was only efficient for the majority of the students in section 6. Students in sections 5, 7

and 8, on the other hand, showed extremely low efficiency. For example, only 1 student from section 8, only 2 students from section 7, and only 4 students from section 5 revealed high efficiency statuses. So, it is clear that the week in which the movie Maya was screened, the learning environment lacked serious efficiency, and as ANOVA results clearly indicate, sections of the participants have a role in such efficiency statuses:

Table 4.16: SPSS tool ANOVA test result of the movie Maya for Section variable.

Dependent	Variable	Sum of Squares	df	Mean Square	F	Sig.
Section	Between Groups	6,000	1	6,000	4,019	,048
	Within Groups	158,250	106	1,493		
	Total	164,250	107			

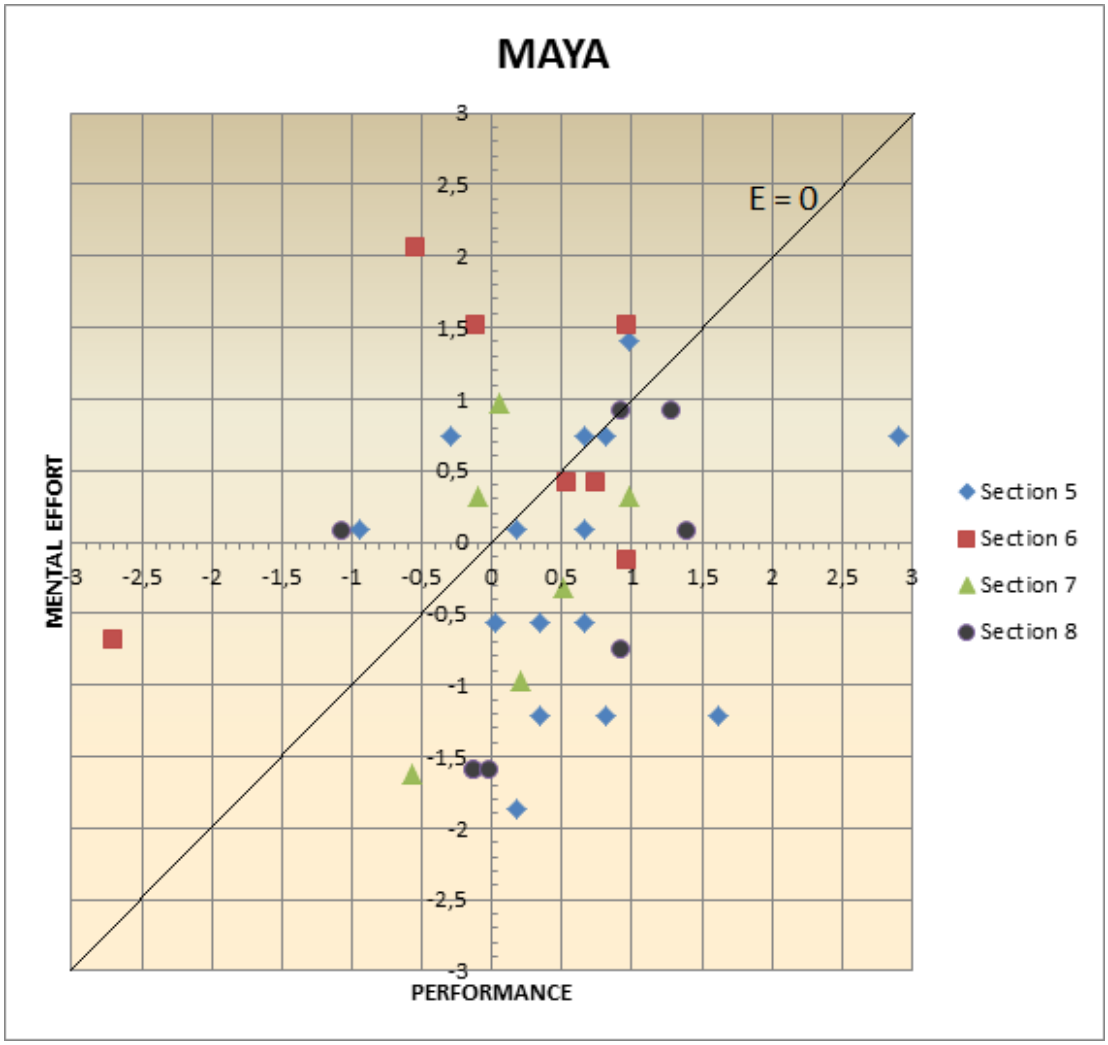

Figure 4.16: Distribution of Students by Sections on Efficiency Graph for the movie Maya.

When we proceed to the movie Columbus, we once again face with diverse results among different sections.

In sections 5 and 7, the learning environment was inefficient for majority of the students. In section 5, 60 percent of the students revealed low efficiency statuses. This number was 42.85 percent for section 7.

Different from sections 5 and 7, students that made up sections 6 and 8 showed high levels of efficiency. Such an efficient learning environment was particularly evident in section 8, where, according to the calculations, only 2 of the 8 students were faced with inefficient learning environment.

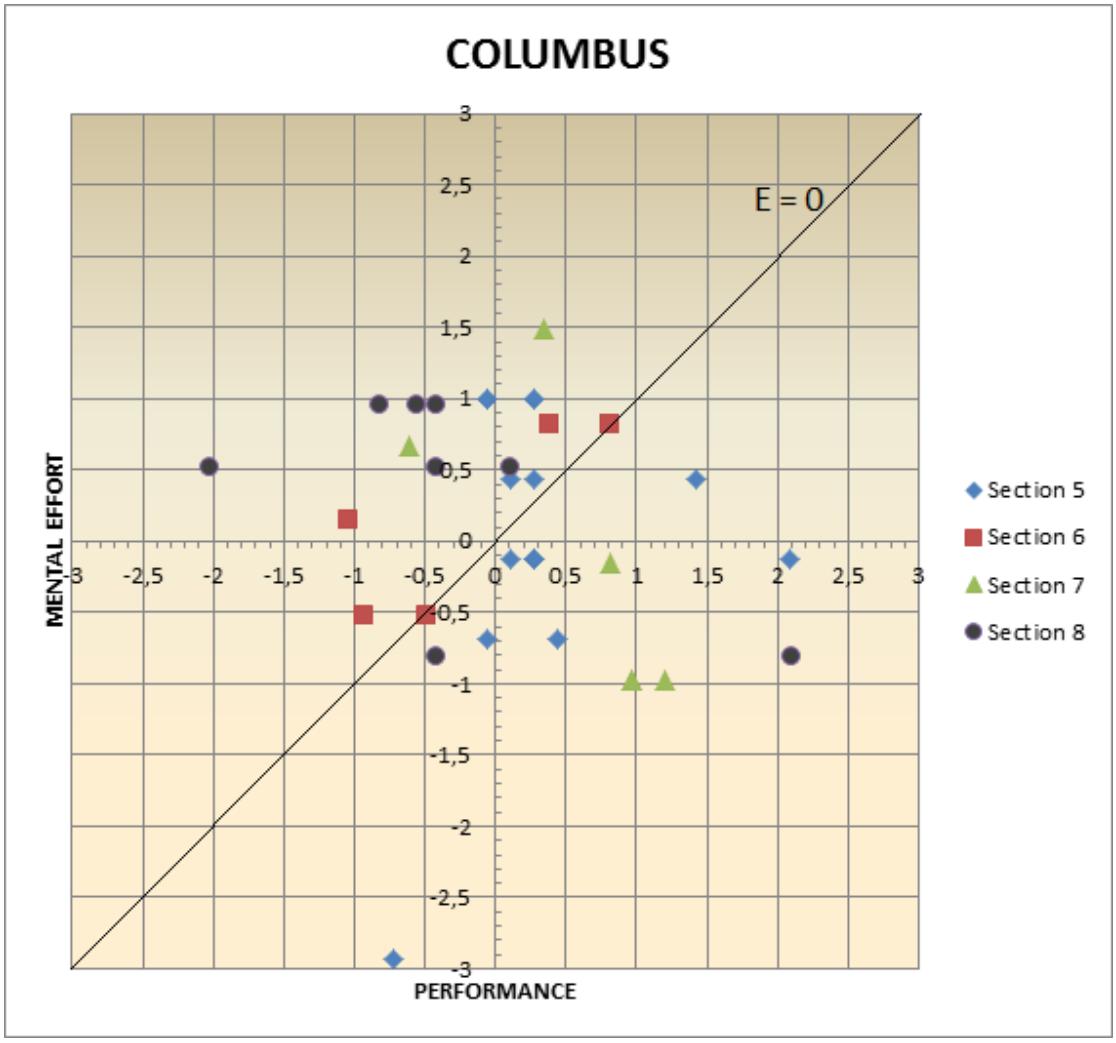

Figure 4.17: Distribution of Students by Sections on Efficiency Graph for the movie Columbus.

Such diversity among sections of Columbus is also reflected in the ANOVA test results for significance:

Table 4.17: SPSS tool ANOVA test result of the movie Columbus for Section variable.

Dependent	Variable	Sum of Squares	df	Mean Square	F	Sig.
Section	Between Groups	6,023	1	6,023	4,035	,047
	Within Groups	158,227	106	1,493		
	Total	164,250	107			

In the week in which Colonial was screened, we see the exact same efficiency results as in the week where Maya was the movie in question. In the week concerned, the only group of students that seemed to experience an efficient level of learning environment was the ones that made up section 6 of the overall sections of History of Civilizations class. So as ANOVA test results also verifies, sections of the students, though not so critically, are significant in determining the environmental efficiency of the class concerned.

Table 4.18: SPSS tool ANOVA test result of the movie Colonial America for Section variable.

Dependent	Variable	Sum of Squares	df	Mean Square	F	Sig.
Section	Between Groups	6,000	1	6,000	4,019	,048
	Within Groups	158,250	106	1,493		
	Total	164,250	107			

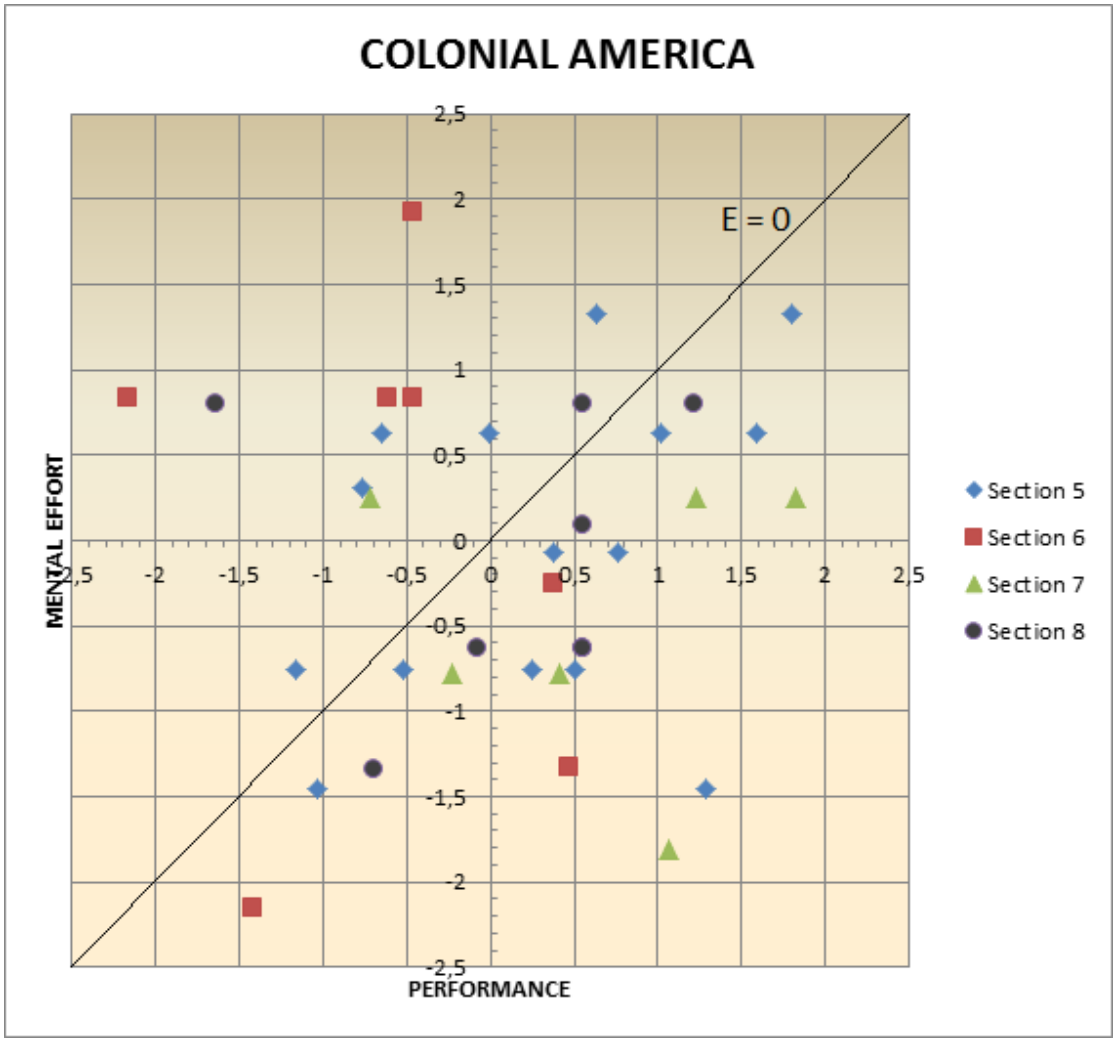

Figure 4.18: Distribution of students by Sections on Efficiency Graph for the movie Colonial America.

Weeks 7 and 9, in which Islam and Galileo were the movies that students were obliged to watch, we see highly similar results of efficiency among students. For both Islam and Galileo, majority of the students of section 6 revealed high efficiency levels for the learning environment, whereas students of sections 7 and 8 predominantly experienced low efficient atmosphere for learning.

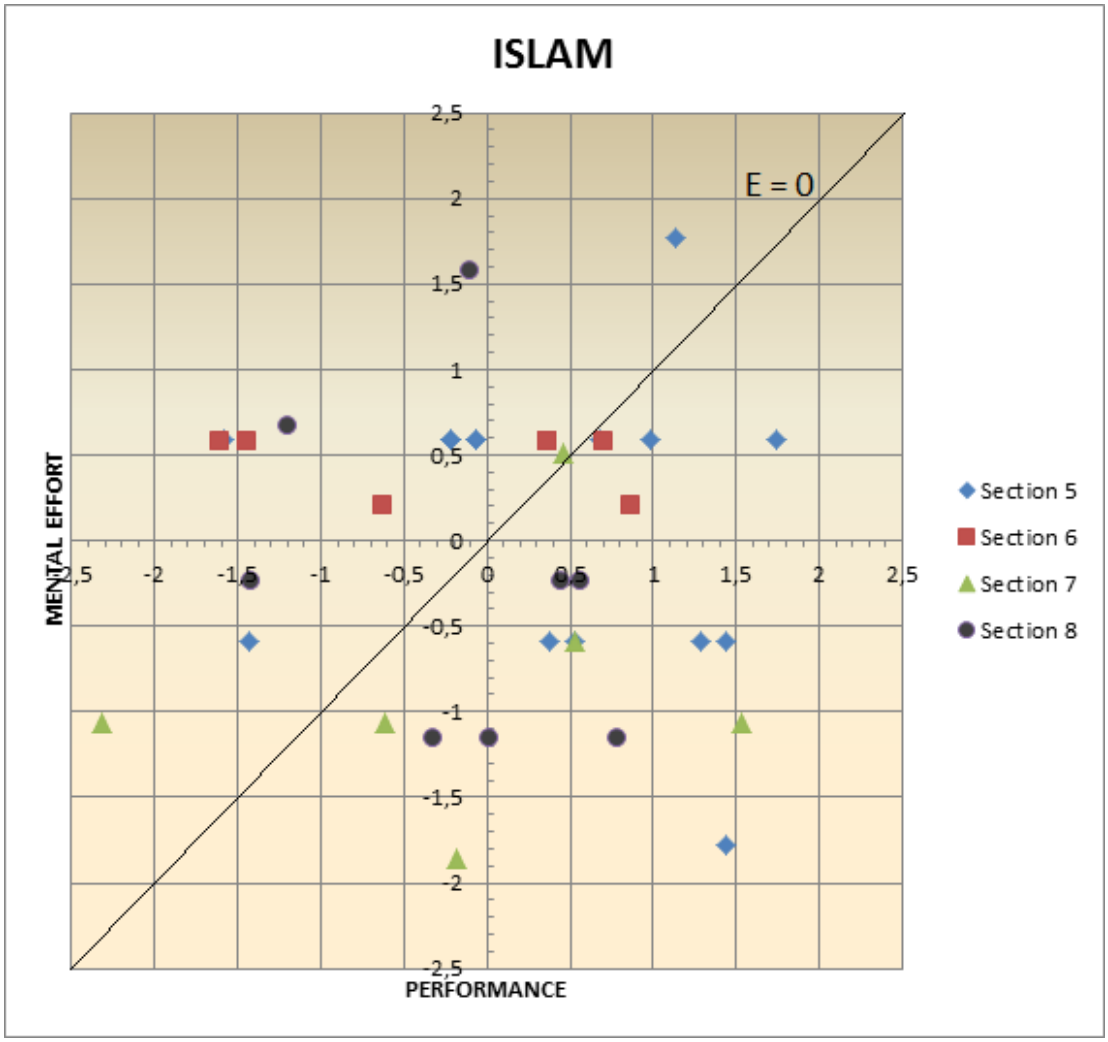

Figure 4.19: Distribution of Students by Sections on Efficiency Graph for the movie Islam.

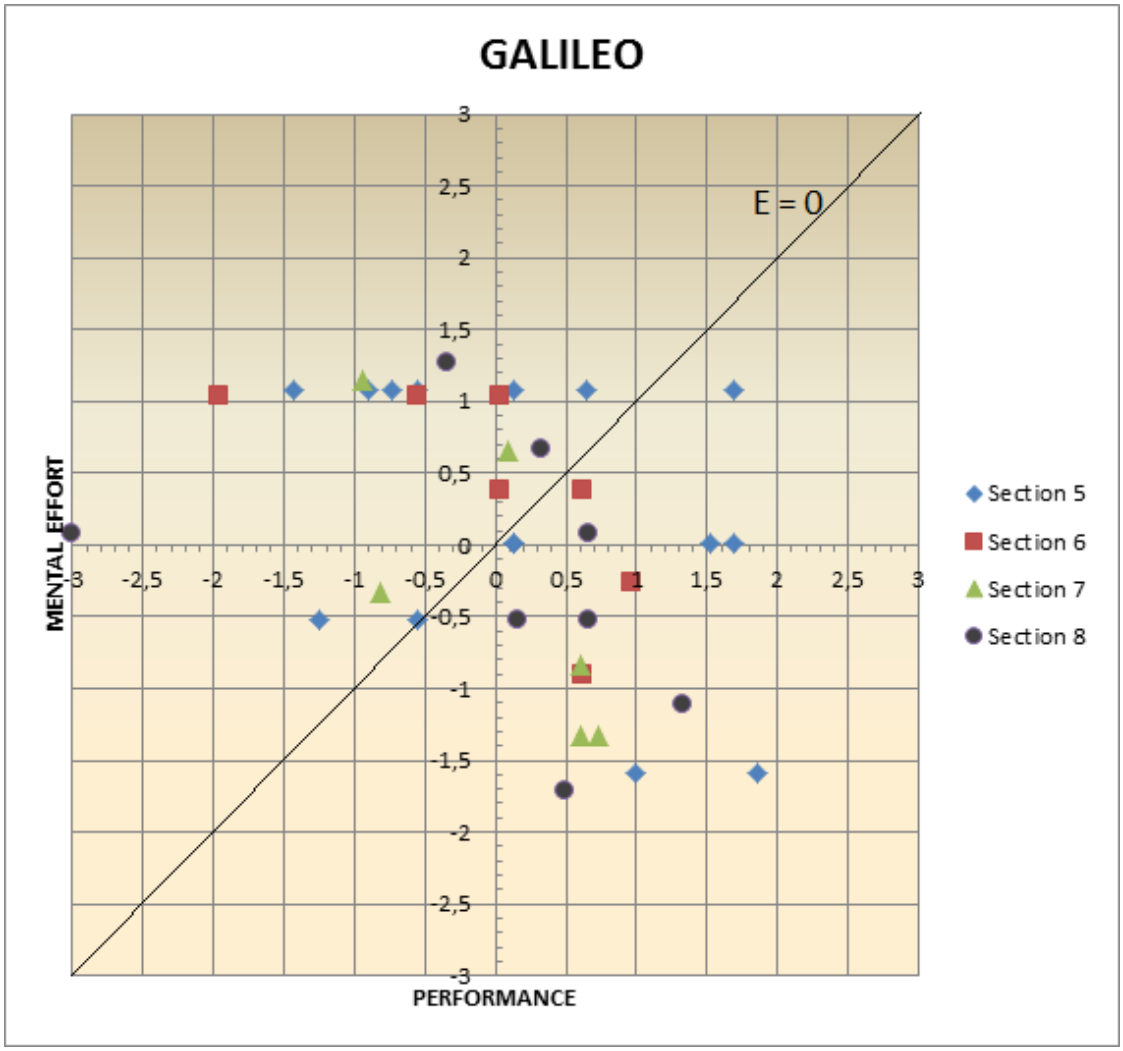

Figure 4.20: Distribution of Students by Sections on Efficiency Graph for the movie Galileo.

In line with such differences in various sections, ANOVA test proved once again that sections of the participants are important factors in determining the environmental efficiency of the class in week 7 and week 9.

Table 4.19: SPSS tool ANOVA test result of the movie Islam for Section variable.

Dependent	Variable	Sum of Squares	df	Mean Square	F	Sig.
Section	Between Groups	8,083	1	8,083	5,486	,021
	Within Groups	156,167	106	1,473		
	Total	164,250	107			

Table 4.20: SPSS tool ANOVA test result of the movie Galileo for Section variable.

Dependent	Variable	Sum of Squares	df	Mean Square	F	Sig.
Section	Between Groups	7,063	1	7,063	4,763	,037
	Within Groups	157,187	106	1,483		
	Total	164,250	107			

Lastly, about the final movie, Newton, sections 5, 6, 7 and 8 experienced differently efficient atmospheres for learning. Precisely, 11 of the 15 students of section 5 experienced low efficient learning environment, 5 of the 7 students of section 6 experienced high efficient learning environment and 2 of the 6 students of section 7 experienced low efficient learning environment. The number of students who experienced high and low levels of efficiency in terms of the learning environment is in equilibrium among the students of section 8.

Results of the ANOVA test also illustrated the significance of sections in determining the efficiency of the learning environment for week 7, where Newton was screened:

Table 4.21: SPSS tool ANOVA test result of the movie Newton for Section variable.

Dependent	Variable	Sum of Squares	df	Mean Square	F	Sig.
Section	Between Groups	7,101	1	7,101	4,790	,031
	Within Groups	157,149	106	1,483		
	Total	164,250	107			

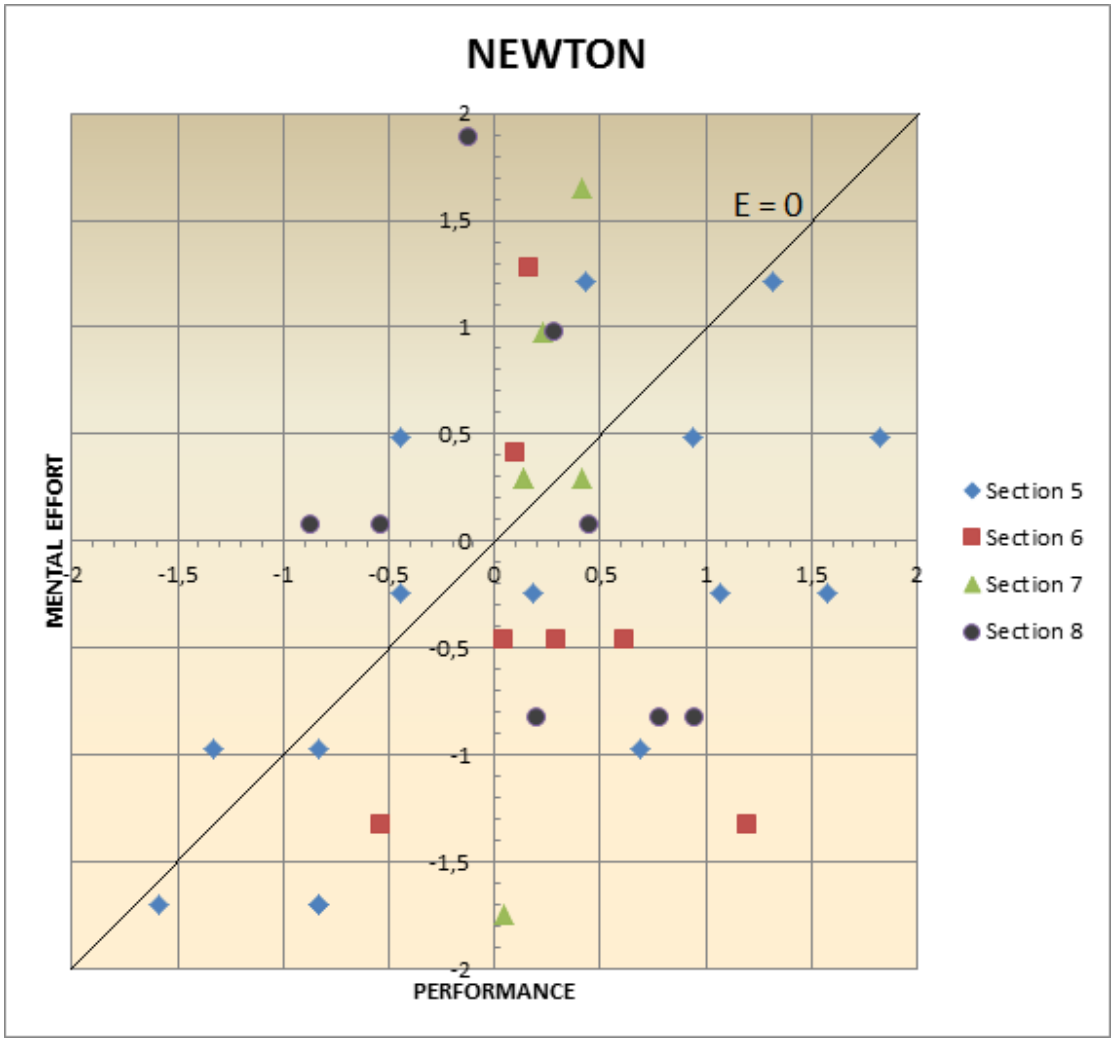

Figure 4.21: Distribution of Students by Sections on Efficiency Graph for the movie Newton.

So, based on the analysis of film-based efficiency of the different sections, we see that students of the sections 5 and 8 revealed low efficiency in majority of the movies. On the other hand, learning environment was efficient for students of the section 6 in every film. Apart from them, section 7 exposes fluctuating and unsteady results about the learning environment of the class where aforementioned movies were screened.

4.5. SECTION-BASED EFFICIENCY OF DIFFERENT FILMS

The section-based analysis of the different movies that were screened throughout the History of Civilization course once again shows an interesting table of results about how efficient the learning environment of the class is.

For the students of section 5, the learning environment was efficient the most in week 9, where the movie in focus was Galileo. On the other hand, students found the learning environment least efficient during the weeks of the screening of Maya, Colonial and Newton.

The most efficient learning environment that was provided to the students of section 6 were the weeks that Islam and Newton were the movies in question. Instead, the weeks of Hannibal, Maya, Columbus and Colonial were considered as the least efficient for the students of section 6.

Students of section 7 considered the week of the movie Newton as the most efficient environment for learning. 4 of the 6 students of this section revealed high efficiency statuses during the week in question. Contrariwise, students were faced with the least - efficient environment for learning during the screening of Hannibal, Maya, Columbus and Colonial.

Finally, students of section 8 experienced the highest efficiency about the environment of learning during week 5, in which Columbus was the main focus of attention. Conversely, they faced with the least efficient learning environment in week 4, when students of the section 8 were obliged to watch and analyze the movie called Maya.
To sum up, it is clear that the least efficient learning environment was provided to the students in all of the sections during the screening of the movie Maya. Newton, on the other hand, seems to be showed at an atmosphere that did provide relatively higher efficiency for students in all of the sections, when compared to the other movies in question.

5. DISCUSSION & CONCLUSION

As the efficiency statuses and the ANOVA test result indicate, different variables showed different significance levels for separate weeks of the History of Civilizations class in Bahcesehir University in 2008-2009 Spring Semester. For example, while genders of the participants play a significant role in determining the efficiency of the learning environments of most of the weeks, the same could not be argued fort he different schools that the students were belong to. For majority of the films, efficiency statuses show parallel results and for majority of the students that are both from school of Engineering and School of Arts & Sciences, the environment that the films were shown was low in efficiency.

Like the genders of the students, sections that they belong to were also crucial variables for determining the efficiencies of the learning environments of the weeks of History of Civilizations class. For example, as ANOVA tests also indicated, in majority of the weeks, students of sections 5 and 8 revealed low efficiency statuses, where the learning environment of every week was efficient for the participants of section 6.

Regardless of their genders, sections of schools, however, it is evident that learning environment of the History of Civilizations class was dominantly low for majority of the students. In 252 efficiency results of 36 students for 7 weeks, 144 of them revealed low efficiency statuses for the learning environment of the class.

What can be done for improving the efficiency of the learning environment of the History of Civilizations class in future semesters?

According to the various experiments of Kalyuga, Chandler and Sheller (1999), in order for a learning environment to become effective based on the principles of cognitive load theory;

> *"(1) textual material should be presented in auditory rather than written form;*
> *(2) Textual materials should not be presented in both auditory and written form;*
> *(3) if textual materials must be presented in written form, search for diagrammatic referents should be reduced by using appropriate marker guides such as colour-coding" (Kalyuga, Ayres, Chandler, Sweller, 1999: 369).*

Similarly, Mayer and Moreno, in their research on reducing excessive cognitive load in learning environments, suggested strategies that were summarized below;

1- Moving some of the processing from visual channel to auditory channel.
2- Allowing time between successive bite-size segments and provide pretraining in names and characteristics of components.
3- Eliminating extraneous material and providing cues for how to process the material to reduce processing of extraneous material.
4- Avoiding to present identical streams of printed and spoken words, and finally
5- Presenting narrations and corresponding animation simultaneously to minimize need to hold representations in memory. (Mayer, Moreno, 2003: 46).

So, according to these suggestions of CLT, there are numerous ways to improve the efficiency of the learning environment of the History of Civilizations class.

For example, in line with the second suggestion of Mayer and Moreno, films that were shown during a class time can be divided into parts, and five - minute breaks can be taken between each parts. What is more, before the screening, instructor can give brief information about the theme or characters of the movie in question. Also, in order to avoid extraneous material, instructor can also give students some clues about important points, conversations or scenes of the movies. By this way, students will know the points that they have to pay attention to in order process the material more efficiently.

In terms of the strategies proposed by Mayer and Moreno, instructor can increase the efficiency of the class by explaining some of the germane cognitive material along with the visual material to minimize need to hold representations in memory, and to shift some of the processing from visual channel to auditory channel. If these suggestions will taken into account for History of Civilizations class in future semesters, according to CLT, the efficiency of the learning environment, and consequently, performance of the students may increase dramatically.

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APPENDICES

APPENDIX A:

Table A.1: Gender based student data for the movie Maya.

MAYA					
Student	**Gender**	**Mental Effort**	**Performance**	**Efficiency**	**Status**
std1	M	2,897514472	0,746653393	-1,52089	Low
std2	F	-0,299742876	0,746653393	0,739914	High
std3	F	0,659434328	0,746653393	0,061673	High
std4	F	0,339708593	-0,559990045	-0,63618	Low
std5	F	0,819297195	-1,213311764	-1,43727	Low
std6	F	0,659434328	-0,559990045	-0,86226	Low
std7	M	0,339708593	-1,213311764	-1,09815	Low
std8	F	1,618611533	-1,213311764	3,942386	High
std9	F	0,979160063	1,399975112	0,297561	High
std10	M	-0,939194346	0,093331674	0,730106	High
std11	M	0,659434328	0,093331674	-0,4003	Low
std12	F	0,179845726	0,093331674	-0,06117	Low
std13	M	0,179845726	-1,866633482	-1,44708	Low
std14	F	0,819297195	0,746653393	-0,05137	Low
std15	F	0,019982858	-0,559990045	-0,4101	Low
std16	M	0,962361748	1,512702469	0,38915	High
std17	M	0,530809395	0,41654126	-0,0808	Low
std18	M	-2,705833256	-0,67961995	1,432749	High
std19	F	-0,116519135	1,512702469	1,152034	High
std20	M	-0,548071489	2,060783073	1,844739	High
std21	F	0,746585571	0,41654126	-0,23338	Low
std22	M	0,962361748	-0,131539345	-0,7735	Low
std23	M	0,512449277	-0,324927206	-0,59211	Low
std24	F	0,203262004	-0,974781618	-0,833	Low
std25	M	-0,10592527	0,324927206	0,304659	High
std26	F	0,048668367	0,974781618	0,654861	High
std27	F	0,976230187	0,324927206	-0,46054	Low
std28	M	-0,56970618	-1,62463603	-0,74595	Low
std29	M	-0,12887747	-1,595099576	-1,03678	Low
std30	M	-0,12887747	-1,595099576	-1,03678	Low
std31	M	1,398699599	0,081106758	-0,93168	Low
std32	M	0,928675885	0,919209925	-0,00669	Low
std33	M	-1,068924897	0,081106758	0,813195	High
std34	M	-0,011371541	-1,595099576	-1,11986	Low
std35	M	0,928675885	-0,756996409	-1,19195	Low
std36	M	1,28119367	0,919209925	-0,25596	Low

Table A.2: Gender based student data for the movie Colonial America.

COLONIAL AMERICA					
Student	**Gender**	**Mental Effort**	**Performance**	**Efficiency**	**Status**
std1	M	1,795810475	1,322075381	-0,33498	Low
std2	F	-1,16257703	-0,761194916	0,28382	High
std3	F	0,638180582	1,322075381	0,483587	High
std4	F	-0,648074855	0,627651948	0,902075	High
std5	F	-0,519449311	-0,761194916	-0,17094	Low
std6	F	0,766806126	-0,066771484	-0,58943	Low
std7	M	0,252303951	-0,761194916	-0,71665	Low
std8	F	0,509555038	-0,761194916	-0,89856	Low
std9	F	1,281308301	-1,455618348	-1,9353	Low
std10	M	0,380929495	-0,066771484	-0,31657	Low
std11	M	-1,033951486	-1,455618348	-0,29816	Low
std12	F	1,024057213	0,627651948	-0,2803	Low
std13	M	-0,761194916	0,309470859	-0,75708	Low
std14	F	-0,004947136	0,627651948	0,447315	High
std15	F	1,595726296	0,627651948	-0,68453	Low
std16	M	-0,467858969	0,837820443	0,923255	High
std17	M	-0,467858969	1,922058664	1,689927	High
std18	M	-2,166304973	0,837820443	2,124237	High
std19	F	0,475722145	-1,330655998	-1,2773	Low
std20	M	-0,609396136	0,837820443	1,023337	High
std21	F	0,381364033	-0,246417777	-0,44391	Low
std22	M	-1,419828117	-2,15004178	-0,51634	Low
std23	M	0,4169233	-0,784132521	-0,84927	Low
std24	F	-0,72212334	0,246441649	0,684879	High
std25	M	1,230528042	0,246441649	-0,69585	Low
std26	F	1,067807094	-1,81470669	-2,03825	Low
std27	F	-0,233960494	-0,784132521	-0,38903	Low
std28	M	1,82717152	0,246441649	-1,11774	Low
std29	M	-0,074671114	-0,626859132	-0,39046	Low
std30	M	-0,701458189	-1,339757752	-0,45135	Low
std31	M	0,552115962	0,798938109	0,17453	High
std32	M	-1,641638802	0,798938109	1,725748	High
std33	M	0,552115962	-0,626859132	-0,83366	Low
std34	M	0,552115962	-0,626859132	-0,83366	Low
std35	M	0,552115962	0,086039489	-0,32957	Low
std36	M	1,21807723	0,798938109	-0,29638	Low

Table A.3: Gender based student data for the movie Islam.

ISLAM					
Student	**Gender**	**Mental Effort**	**Performance**	**Efficiency**	**Status**
std1	M	0,685493842	0,591607978	-0,06639	Low
std2	F	0,534096429	-0,591607978	-0,79599	Low
std3	F	-0,222890636	0,591607978	0,575937	High
std4	F	-0,222890636	0,591607978	0,575937	High
std5	F	1,442480906	-0,591607978	-1,43832	Low
std6	F	1,291083493	-0,591607978	-1,33126	Low
std7	M	1,442480906	-1,774823935	-2,27498	Low
std8	F	1,745275732	0,591607978	-0,81577	Low
std9	F	0,382699016	-0,591607978	-0,68894	Low
std10	M	-0,071493223	0,591607978	0,468883	High
std11	M	0,988288667	0,591607978	-0,2805	Low
std12	F	-0,071493223	0,591607978	0,468883	High
std13	M	-1,585467351	0,591607978	1,539425	High
std14	F	-1,434069938	-0,591607978	0,595711	High
std15	F	1,13968608	1,774823935	0,44911	High
std16	M	-1,611298348	0,575806507	1,546517	High
std17	M	-1,446206304	0,575806507	1,429779	High
std18	M	-0,620746085	0,206699772	0,585093	High
std19	F	0,369806178	0,575806507	0,145664	High
std20	M	0,86508231	0,206699772	-0,46555	Low
std21	F	0,369806178	0,575806507	0,145664	High
std22	M	0,699990266	0,575806507	-0,08781	Low
std23	M	0,461221797	0,51701435	0,039451	High
std24	F	0,534096429	-0,591607978	-0,79599	Low
std25	M	-2,322581192	-1,06444131	0,889639	High
std26	F	-0,60947166	-1,06444131	-0,32171	Low
std27	F	1,531915254	-1,06444131	-1,8359	Low
std28	M	-0,181194277	-1,855169139	-1,18368	Low
std29	M	0,452158929	-0,239762274	-0,48926	Low
std30	M	-0,318830014	-1,150858914	-0,58833	Low
std31	M	-0,098547459	1,582431006	1,188631	High
std32	M	-1,42024279	-0,239762274	0,834726	High
std33	M	-1,199960234	0,671334366	1,323205	High
std34	M	0,011593819	-1,150858914	-0,82198	Low
std35	M	0,782582762	-1,150858914	-1,36715	Low
std36	M	0,562300206	-0,239762274	-0,56714	Low

Table A.4: Gender based student data for the movie Columbus.

COLUMBUS					
Student	**Gender**	**Mental Effort**	**Performance**	**Efficiency**	**Status**
std1	M	2,083212046	-0,124586407	-1,56115	Low
std2	F	1,423909772	0,436052425	-0,69852	Low
std3	F	-0,059520344	-0,68522524	-0,44244	Low
std4	F	0,270130793	-0,124586407	-0,27911	Low
std5	F	-0,718822618	-2,927780571	-1,56197	Low
std6	F	0,270130793	0,436052425	0,117324	High
std7	M	0,270130793	0,996691258	0,513756	High
std8	F	-0,059520344	0,996691258	0,746854	High
std9	F	0,270130793	0,996691258	0,513756	High
std10	M	0,434956361	-0,68522524	-0,79209	Low
std11	M	0,105305224	0,436052425	0,233874	High
std12	F	0,270130793	-0,124586407	-0,27911	Low
std13	M	-0,059520344	0,996691258	0,746854	High
std14	F	0,105305224	-0,124586407	-0,16256	Low
std15	F	0,270130793	-0,124586407	-0,27911	Low
std16	M	0,820118904	0,817692914	-0,00172	Low
std17	M	0,820118904	0,817692914	-0,00172	Low
std18	M	-1,034828145	0,150627642	0,838244	High
std19	F	0,383660775	0,817692914	0,306907	High
std20	M	-0,925713613	-0,51643763	0,289402	High
std21	F	0,383660775	0,817692914	0,306907	High
std22	M	-0,489255483	-0,51643763	-0,01922	Low
std23	M	0,33629573	1,485384425	0,812528	High
std24	F	0,807661055	-0,158633288	-0,68327	Low
std25	M	-0,606434922	0,663375569	0,897892	High
std26	F	1,200465494	-0,980642145	-1,54228	Low
std27	F	0,964782831	-0,980642145	-1,37562	Low
std28	M	0,964782831	-0,980642145	-1,37562	Low
std29	M	-0,425132973	0,512569286	0,663056	High
std30	M	-0,425132973	-0,81408063	-0,27503	Low
std31	M	-0,557798582	0,954785924	1,069559	High
std32	M	0,105529461	0,512569286	0,287821	High
std33	M	-2,017120277	0,512569286	1,788761	High
std34	M	2,095513591	-0,81408063	-2,05739	Low
std35	M	-0,425132973	0,954785924	0,97575	High
std36	M	-0,823129799	0,954785924	1,257176	High

Table A.5: Gender based student data for the movie Galileo.

GALILEO					
Student	**Gender**	**Mental Effort**	**Performance**	**Efficiency**	**Status**
std1	M	1,689443601	1,075792999	-0,43392	Low
std2	F	0,132305824	0,007852504	-0,088	Low
std3	F	-0,55975541	1,075792999	1,156507	High
std4	F	-1,424831952	1,075792999	1,768209	High
std5	F	0,997382367	-1,59405824	-1,83243	Low
std6	F	0,132305824	0,007852504	-0,088	Low
std7	M	-0,905786027	1,075792999	1,401188	High
std8	F	1,516428292	0,007852504	-1,06672	Low
std9	F	1,862458909	-1,59405824	-2,44413	Low
std10	M	-0,55975541	-0,526117744	0,023785	High
std11	M	-1,251816644	-0,526117744	0,513147	High
std12	F	-0,732770718	1,075792999	1,278848	High
std13	M	0,132305824	1,075792999	0,667146	High
std14	F	1,689443601	0,007852504	-1,18906	Low
std15	F	0,65135175	1,075792999	0,300125	High
std16	M	0,959952053	-0,262232514	-0,86421	Low
std17	M	0,61020208	0,386447915	-0,15822	Low
std18	M	-0,555631162	1,035128343	1,124837	High
std19	F	-1,954631053	1,035128343	2,114079	High
std20	M	0,027285459	0,386447915	0,253966	High
std21	F	0,61020208	-0,910912942	-1,07559	Low
std22	M	0,027285459	1,035128343	0,712653	High
std23	M	0,082736496	0,654817432	0,404522	High
std24	F	-0,949036283	1,150607774	1,484673	High
std25	M	-0,820064685	-0,336763251	0,341746	High
std26	F	0,598622886	-0,832553592	-1,01199	Low
std27	F	0,727594483	-1,328343934	0,727594	High
std28	M	0,598622886	-1,328343934	-1,36257	Low
std29	M	0,659126225	0,077030477	-0,4116	Low
std30	M	0,160161513	-0,517204629	-0,47897	Low
std31	M	0,326483083	0,671265582	0,243798	High
std32	M	-0,3388032	1,265500688	1,134414	High
std33	M	-2,999948331	0,077030477	2,175753	High
std34	M	1,324412507	-1,111439735	-1,72241	Low
std35	M	0,659126225	-0,517204629	-0,83179	Low
std36	M	0,492804654	-1,705674841	-1,55456	Low

Table A.6: Gender based student data for the movie Newton.

NEWTON					
Student	**Gender**	**Mental Effort**	**Performance**	**Efficiency**	**Status**
std1	M	-1,585490654	-1,698453106	-0,07988	Low
std2	F	-0,827822554	-0,970544632	-0,10092	Low
std3	F	1,31890373	1,21318079	-0,07476	Low
std4	F	-0,448988504	0,485272316	0,660622	High
std5	F	0,434957613	1,21318079	0,550287	High
std6	F	1,066347696	-0,242636158	-0,92559	Low
std7	M	-0,827822554	-1,698453106	-0,61563	Low
std8	F	1,824015796	0,485272316	-0,94663	Low
std9	F	1,571459763	-0,242636158	-1,28276	Low
std10	M	-0,448988504	-0,242636158	0,145913	High
std11	M	-0,827822554	-1,698453106	-0,61563	Low
std12	F	0,687513646	-0,970544632	-1,17242	Low
std13	M	-1,33293462	-0,970544632	0,256248	High
std14	F	0,18240158	-0,242636158	-0,30055	Low
std15	F	0,94006968	0,485272316	-0,32159	Low
std16	M	1,193583045	-1,324750501	-1,78073	Low
std17	M	0,039907032	-0,457938445	-0,35203	Low
std18	M	-0,536930975	-1,324750501	-0,55707	Low
std19	F	0,296279479	-0,457938445	-0,53331	Low
std20	M	0,168093256	1,275685668	0,783186	High
std21	F	0,104000144	0,408873611	0,215578	High
std22	M	0,616745039	-0,457938445	-0,75992	Low
std23	M	0,416220418	1,654360577	0,875497	High
std24	F	0,231233566	0,974891054	0,525845	High
std25	M	0,138740139	0,295421532	0,11079	High
std26	F	0,416220418	0,295421532	-0,08542	Low
std27	F	0,138740139	0,295421532	0,11079	High
std28	M	0,046246713	-1,742987036	-1,26518	Low
std29	M	0,945847888	-0,829425535	-1,25531	Low
std30	M	-0,867981476	0,075402321	0,667073	High
std31	M	0,286273574	0,980230178	0,490701	High
std32	M	-0,125960373	1,885058035	1,422005	High
std33	M	-0,538194319	0,075402321	0,433878	High
std34	M	0,78095431	-0,829425535	-1,13871	Low
std35	M	0,451167153	0,075402321	-0,26571	Low
std36	M	0,203826785	-0,829425535	-0,73062	Low

Table A.7: Gender based student data for the movie Hannibal.

HANNIBAL					
Student	**Gender**	**Mental Effort**	**Performance**	**Efficiency**	**Status**
std1	M	0,919917684	-2,455741776	-2,386951695	Low
std2	F	-0,599496918	0,522756913	0,793553294	High
std3	F	-0,261849228	1,11845665	0,976023647	High
std4	F	-2,456559208	1,11845665	2,527917957	High
std5	F	1,257565373	0,522756913	-0,519588045	Low
std6	F	0,244622305	0,522756913	0,196670867	High
std7	M	0,41344615	0,522756913	0,077294381	High
std8	F	-0,768320762	0,522756913	0,912929779	High
std9	F	1,595213062	-3,051441513	-3,28568096	Low
std10	M	1,426389218	0,522756913	-0,638964531	Low
std11	M	0,751093839	0,522756913	-0,161458589	Low
std12	F	0,41344615	0,522756913	0,077294381	High
std13	M	-1,274792296	0,522756913	1,271059235	High
std14	F	0,41344615	-1,2643423	-1,186375591	Low
std15	F	0,751093839	-0,072942825	-0,582681913	Low
std16	M	-0,074097897	0,363907067	0,30971628	High
std17	M	0,592783175	0,363907067	-0,161839848	Low
std18	M	0,72615939	-0,991333044	-1,214450547	Low
std19	F	-0,340850326	0,363907067	0,498338731	High
std20	M	-0,340850326	0,363907067	0,498338731	High
std21	F	0,192654532	0,363907067	0,121093829	High
std22	M	0,992911819	0,363907067	-0,444773526	Low
std23	M	0,615585975	-1,174779754	-1,265979748	Low
std24	F	-0,643356771	1,140728167	1,261538558	High
std25	M	-0,013885398	1,140728167	0,816435082	High
std26	F	1,245057348	-0,017025794	-0,892427548	Low
std27	F	2,346632251	-0,017025794	-1,671358632	Low
std28	M	1,087689505	-1,174779754	-1,599807355	Low
std29	M	0,704188727	-0,21319721	-0,648689817	Low
std30	M	-0,144090268	1,428421306	1,111933598	High
std31	M	2,037198577	1,428421306	-0,430470536	Low
std32	M	1,310102295	0,607612048	-0,496735617	Low
std33	M	-0,87118655	-0,21319721	0,465268724	High
std34	M	0,340640586	-0,21319721	-0,391622461	Low
std35	M	-0,386455696	0,607612048	0,702912043	High
std36	M	3,127842999	-1,034006468	-2,94287198	Low

Table A.8: School based student data for the movie Maya.

MAYA					
Student	**Faculty**	**Mental Effort**	**Performance**	**Efficiency**	**Status**
std1	Art&Sci	2,897514472	0,746653393	-1,52089	Low
std2	Art&Sci	-0,299742876	0,746653393	0,739914	High
std3	Art&Sci	0,659434328	0,746653393	0,061673	High
std4	Art&Sci	0,339708593	-0,559990045	-0,63618	Low
std5	Art&Sci	0,819297195	-1,213311764	-1,43727	Low
std6	Art&Sci	0,659434328	-0,559990045	-0,86226	Low
std7	Art&Sci	0,339708593	-1,213311764	-1,09815	Low
std8	Art&Sci	1,618611533	-1,213311764	3,942386	High
std9	Art&Sci	0,979160063	1,399975112	0,297561	High
std10	Art&Sci	-0,939194346	0,093331674	0,730106	High
std11	Art&Sci	0,659434328	0,093331674	-0,4003	Low
std12	Art&Sci	0,179845726	0,093331674	-0,06117	Low
std13	Art&Sci	0,179845726	-1,866633482	-1,44708	Low
std14	Art&Sci	0,819297195	0,746653393	-0,05137	Low
std15	Art&Sci	0,019982858	-0,559990045	-0,4101	Low
std16	Eng	0,962361748	1,512702469	0,38915	High
std17	Eng	0,530809395	0,41654126	-0,0808	Low
std18	Eng	-2,705833256	-0,67961995	1,432749	High
std19	Eng	-0,116519135	1,512702469	1,152034	High
std20	Eng	-0,548071489	2,060783073	1,844739	High
std21	Eng	0,746585571	0,41654126	-0,23338	Low
std22	Eng	0,962361748	-0,131539345	-0,7735	Low
std23	Eng	0,512449277	-0,324927206	-0,59211	Low
std24	Eng	0,203262004	-0,974781618	-0,833	Low
std25	Eng	-0,10592527	0,324927206	0,304659	High
std26	Eng	0,048668367	0,974781618	0,654861	High
std27	Eng	0,976230187	0,324927206	-0,46054	Low
std28	Eng	-0,56970618	-1,62463603	-0,74595	Low
std29	Eng	-0,12887747	-1,595099576	-1,03678	Low
std30	Eng	-0,12887747	-1,595099576	-1,03678	Low
std31	Eng	1,398699599	0,081106758	-0,93168	Low
std32	Eng	0,928675885	0,919209925	-0,00669	Low
std33	Eng	-1,068924897	0,081106758	0,813195	High
std34	Eng	-0,011371541	-1,595099576	-1,11986	Low
std35	Eng	0,928675885	-0,756996409	-1,19195	Low
std36	Eng	1,28119367	0,919209925	-0,25596	Low

Table A.9: School based student data for the movie Columbus.

COLUMBUS					
Student	**Faculty**	**Mental Effort**	**Performance**	**Efficiency**	**Status**
std1	Art&Sci	2,083212046	-0,124586407	-1,56115	Low
std2	Art&Sci	1,423909772	0,436052425	-0,69852	Low
std3	Art&Sci	-0,059520344	-0,68522524	-0,44244	Low
std4	Art&Sci	0,270130793	-0,124586407	-0,27911	Low
std5	Art&Sci	-0,718822618	-2,927780571	-1,56197	Low
std6	Art&Sci	0,270130793	0,436052425	0,117324	High
std7	Art&Sci	0,270130793	0,996691258	0,513756	High
std8	Art&Sci	-0,059520344	0,996691258	0,746854	High
std9	Art&Sci	0,270130793	0,996691258	0,513756	High
std10	Art&Sci	0,434956361	-0,68522524	-0,79209	Low
std11	Art&Sci	0,105305224	0,436052425	0,233874	High
std12	Art&Sci	0,270130793	-0,124586407	-0,27911	Low
std13	Art&Sci	-0,059520344	0,996691258	0,746854	High
std14	Art&Sci	0,105305224	-0,124586407	-0,16256	Low
std15	Art&Sci	0,270130793	-0,124586407	-0,27911	Low
std16	Eng	0,820118904	0,817692914	-0,00172	Low
std17	Eng	0,820118904	0,817692914	-0,00172	Low
std18	Eng	-1,034828145	0,150627642	0,838244	High
std19	Eng	0,383660775	0,817692914	0,306907	High
std20	Eng	-0,925713613	-0,51643763	0,289402	High
std21	Eng	0,383660775	0,817692914	0,306907	High
std22	Eng	-0,489255483	-0,51643763	-0,01922	Low
std23	Eng	0,33629573	1,485384425	0,812528	High
std24	Eng	0,807661055	-0,158633288	-0,68327	Low
std25	Eng	-0,606434922	0,663375569	0,897892	High
std26	Eng	1,200465494	-0,980642145	-1,54228	Low
std27	Eng	0,964782831	-0,980642145	-1,37562	Low
std28	Eng	0,964782831	-0,980642145	-1,37562	Low
std29	Eng	-0,425132973	0,512569286	0,663056	High
std30	Eng	-0,425132973	-0,81408063	-0,27503	Low
std31	Eng	-0,557798582	0,954785924	1,069559	High
std32	Eng	0,105529461	0,512569286	0,287821	High
std33	Eng	-2,017120277	0,512569286	1,788761	High
std34	Eng	2,095513591	-0,81408063	-2,05739	Low
std35	Eng	-0,425132973	0,954785924	0,97575	High
std36	Eng	-0,823129799	0,954785924	1,257176	High

Table A.10: School based student data for the movie Colonial America.

COLONIAL AMERICA					
Student	**Faculty**	**Mental Effort**	**Performance**	**Efficiency**	**Status**
std1	Art&Sci	1,795810475	1,322075381	-0,33498	Low
std2	Art&Sci	-1,16257703	-0,761194916	0,28382	High
std3	Art&Sci	0,638180582	1,322075381	0,483587	High
std4	Art&Sci	-0,648074855	0,627651948	0,902075	High
std5	Art&Sci	-0,519449311	-0,761194916	-0,17094	Low
std6	Art&Sci	0,766806126	-0,066771484	-0,58943	Low
std7	Art&Sci	0,252303951	-0,761194916	-0,71665	Low
std8	Art&Sci	0,509555038	-0,761194916	-0,89856	Low
std9	Art&Sci	1,281308301	-1,455618348	-1,9353	Low
std10	Art&Sci	0,380929495	-0,066771484	-0,31657	Low
std11	Art&Sci	-1,033951486	-1,455618348	-0,29816	Low
std12	Art&Sci	1,024057213	0,627651948	-0,2803	Low
std13	Art&Sci	-0,761194916	0,309470859	-0,75708	Low
std14	Art&Sci	-0,004947136	0,627651948	0,447315	High
std15	Art&Sci	1,595726296	0,627651948	-0,68453	Low
std16	Eng	-0,467858969	0,837820443	0,923255	High
std17	Eng	-0,467858969	1,922058664	1,689927	High
std18	Eng	-2,166304973	0,837820443	2,124237	High
std19	Eng	0,475722145	-1,330655998	-1,2773	Low
std20	Eng	-0,609396136	0,837820443	1,023337	High
std21	Eng	0,381364033	-0,246417777	-0,44391	Low
std22	Eng	-1,419828117	-2,15004178	-0,51634	Low
std23	Eng	0,4169233	-0,784132521	-0,84927	Low
std24	Eng	-0,72212334	0,246441649	0,684879	High
std25	Eng	1,230528042	0,246441649	-0,69585	Low
std26	Eng	1,067807094	-1,81470669	-2,03825	Low
std27	Eng	-0,233960494	-0,784132521	-0,38903	Low
std28	Eng	1,82717152	0,246441649	-1,11774	Low
std29	Eng	-0,074671114	-0,626859132	-0,39046	Low
std30	Eng	-0,701458189	-1,339757752	-0,45135	Low
std31	Eng	0,552115962	0,798938109	0,17453	High
std32	Eng	-1,641638802	0,798938109	1,725748	High
std33	Eng	0,552115962	-0,626859132	-0,83366	Low
std34	Eng	0,552115962	-0,626859132	-0,83366	Low
std35	Eng	0,552115962	0,086039489	-0,32957	Low
std36	Eng	1,21807723	0,798938109	-0,29638	Low

Table A.11: School based student data for the movie Hannibal.

HANNIBAL					
Student	**Faculty**	**Mental Effort**	**Performance**	**Efficiency**	**Status**
std1	Art&Sci	0,919917684	-2,455741776	-2,386951695	Low
std2	Art&Sci	-0,599496918	0,522756913	0,793553294	High
std3	Art&Sci	-0,261849228	1,11845665	0,976023647	High
std4	Art&Sci	-2,456559208	1,11845665	2,527917957	High
std5	Art&Sci	1,257565373	0,522756913	-0,519588045	Low
std6	Art&Sci	0,244622305	0,522756913	0,196670867	High
std7	Art&Sci	0,41344615	0,522756913	0,077294381	High
std8	Art&Sci	-0,768320762	0,522756913	0,912929779	High
std9	Art&Sci	1,595213062	-3,051441513	-3,28568096	Low
std10	Art&Sci	1,426389218	0,522756913	-0,638964531	Low
std11	Art&Sci	0,751093839	0,522756913	-0,161458589	Low
std12	Art&Sci	0,41344615	0,522756913	0,077294381	High
std13	Art&Sci	-1,274792296	0,522756913	1,271059235	High
std14	Art&Sci	0,41344615	-1,2643423	-1,186375591	Low
std15	Art&Sci	0,751093839	-0,072942825	-0,582681913	Low
std16	Eng	-0,074097897	0,363907067	0,30971628	High
std17	Eng	0,592783175	0,363907067	-0,161839848	Low
std18	Eng	0,72615939	-0,991333044	-1,214450547	Low
std19	Eng	-0,340850326	0,363907067	0,498338731	High
std20	Eng	-0,340850326	0,363907067	0,498338731	High
std21	Eng	0,192654532	0,363907067	0,121093829	High
std22	Eng	0,992911819	0,363907067	-0,444773526	Low
std23	Eng	0,615585975	-1,174779754	-1,265979748	Low
std24	Eng	-0,643356771	1,140728167	1,261538558	High
std25	Eng	-0,013885398	1,140728167	0,816435082	High
std26	Eng	1,245057348	-0,017025794	-0,892427548	Low
std27	Eng	2,346632251	-0,017025794	-1,671358632	Low
std28	Eng	1,087689505	-1,174779754	-1,599807355	Low
std29	Eng	0,704188727	-0,21319721	-0,648689817	Low
std30	Eng	-0,144090268	1,428421306	1,111933598	High
std31	Eng	2,037198577	1,428421306	-0,430470536	Low
std32	Eng	1,310102295	0,607612048	-0,496735617	Low
std33	Eng	-0,87118655	-0,21319721	0,465268724	High
std34	Eng	0,340640586	-0,21319721	-0,391622461	Low
std35	Eng	-0,386455696	0,607612048	0,702912043	High
std36	Eng	3,127842999	-1,034006468	-2,94287198	Low

Table A.12: School based student data for the movie Galileo.

GALILEO					
Student	**Faculty**	**Mental Effort**	**Performance**	**Efficiency**	**Status**
std1	Art&Sci	1,689443601	1,075792999	-0,43392	Low
std2	Art&Sci	0,132305824	0,007852504	-0,088	Low
std3	Art&Sci	-0,55975541	1,075792999	1,156507	High
std4	Art&Sci	-1,424831952	1,075792999	1,768209	High
std5	Art&Sci	0,997382367	-1,59405824	-1,83243	Low
std6	Art&Sci	0,132305824	0,007852504	-0,088	Low
std7	Art&Sci	-0,905786027	1,075792999	1,401188	High
std8	Art&Sci	1,516428292	0,007852504	-1,06672	Low
std9	Art&Sci	1,862458909	-1,59405824	-2,44413	Low
std10	Art&Sci	-0,55975541	-0,526117744	0,023785	High
std11	Art&Sci	-1,251816644	-0,526117744	0,513147	High
std12	Art&Sci	-0,732770718	1,075792999	1,278848	High
std13	Art&Sci	0,132305824	1,075792999	0,667146	High
std14	Art&Sci	1,689443601	0,007852504	-1,18906	Low
std15	Art&Sci	0,65135175	1,075792999	0,300125	High
std16	Eng	0,959952053	-0,262232514	-0,86421	Low
std17	Eng	0,61020208	0,386447915	-0,15822	Low
std18	Eng	-0,555631162	1,035128343	1,124837	High
std19	Eng	-1,954631053	1,035128343	2,114079	High
std20	Eng	0,027285459	0,386447915	0,253966	High
std21	Eng	0,61020208	-0,910912942	-1,07559	Low
std22	Eng	0,027285459	1,035128343	0,712653	High
std23	Eng	0,082736496	0,654817432	0,404522	High
std24	Eng	-0,949036283	1,150607774	1,484673	High
std25	Eng	-0,820064685	-0,336763251	0,341746	High
std26	Eng	0,598622886	-0,832553592	-1,01199	Low
std27	Eng	0,727594483	-1,328343934	0,727594	High
std28	Eng	0,598622886	-1,328343934	-1,36257	Low
std29	Eng	0,659126225	0,077030477	-0,4116	Low
std30	Eng	0,160161513	-0,517204629	-0,47897	Low
std31	Eng	0,326483083	0,671265582	0,243798	High
std32	Eng	-0,3388032	1,265500688	1,134414	High
std33	Eng	-2,999948331	0,077030477	2,175753	High
std34	Eng	1,324412507	-1,111439735	-1,72241	Low
std35	Eng	0,659126225	-0,517204629	-0,83179	Low
std36	Eng	0,492804654	-1,705674841	-1,55456	Low

Table A.13: School based student data for the movie Newton.

NEWTON					
Student	**Faculty**	**Mental Effort**	**Performance**	**Efficiency**	**Status**
std1	Art&Sci	-1,585490654	-1,698453106	-0,07988	Low
std2	Art&Sci	-0,827822554	-0,970544632	-0,10092	Low
std3	Art&Sci	1,31890373	1,21318079	-0,07476	Low
std4	Art&Sci	-0,448988504	0,485272316	0,660622	High
std5	Art&Sci	0,434957613	1,21318079	0,550287	High
std6	Art&Sci	1,066347696	-0,242636158	-0,92559	Low
std7	Art&Sci	-0,827822554	-1,698453106	-0,61563	Low
std8	Art&Sci	1,824015796	0,485272316	-0,94663	Low
std9	Art&Sci	1,571459763	-0,242636158	-1,28276	Low
std10	Art&Sci	-0,448988504	-0,242636158	0,145913	High
std11	Art&Sci	-0,827822554	-1,698453106	-0,61563	Low
std12	Art&Sci	0,687513646	-0,970544632	-1,17242	Low
std13	Art&Sci	-1,33293462	-0,970544632	0,256248	High
std14	Art&Sci	0,18240158	-0,242636158	-0,30055	Low
std15	Art&Sci	0,94006968	0,485272316	-0,32159	Low
std16	Eng	1,193583045	-1,324750501	-1,78073	Low
std17	Eng	0,039907032	-0,457938445	-0,35203	Low
std18	Eng	-0,536930975	-1,324750501	-0,55707	Low
std19	Eng	0,296279479	-0,457938445	-0,53331	Low
std20	Eng	0,168093256	1,275685668	0,783186	High
std21	Eng	0,104000144	0,408873611	0,215578	High
std22	Eng	0,616745039	-0,457938445	-0,75992	Low
std23	Eng	0,416220418	1,654360577	0,875497	High
std24	Eng	0,231233566	0,974891054	0,525845	High
std25	Eng	0,138740139	0,295421532	0,11079	High
std26	Eng	0,416220418	0,295421532	-0,08542	Low
std27	Eng	0,138740139	0,295421532	0,11079	High
std28	Eng	0,046246713	-1,742987036	-1,26518	Low
std29	Eng	0,945847888	-0,829425535	-1,25531	Low
std30	Eng	-0,867981476	0,075402321	0,667073	High
std31	Eng	0,286273574	0,980230178	0,490701	High
std32	Eng	-0,125960373	1,885058035	1,422005	High
std33	Eng	-0,538194319	0,075402321	0,433878	High
std34	Eng	0,78095431	-0,829425535	-1,13871	Low
std35	Eng	0,451167153	0,075402321	-0,26571	Low
std36	Eng	0,203826785	-0,829425535	-0,73062	Low

Table A.14: School based student data for the movie Islam.

ISLAM					
Student	**Faculty**	**Mental Effort**	**Performance**	**Efficiency**	**Status**
std1	Art&Sci	0,685493842	0,591607978	-0,06639	Low
std2	Art&Sci	0,534096429	-0,591607978	-0,79599	Low
std3	Art&Sci	-0,222890636	0,591607978	0,575937	High
std4	Art&Sci	-0,222890636	0,591607978	0,575937	High
std5	Art&Sci	1,442480906	-0,591607978	-1,43832	Low
std6	Art&Sci	1,291083493	-0,591607978	-1,33126	Low
std7	Art&Sci	1,442480906	-1,774823935	-2,27498	Low
std8	Art&Sci	1,745275732	0,591607978	-0,81577	Low
std9	Art&Sci	0,382699016	-0,591607978	-0,68894	Low
std10	Art&Sci	-0,071493223	0,591607978	0,468883	High
std11	Art&Sci	0,988288667	0,591607978	-0,2805	Low
std12	Art&Sci	-0,071493223	0,591607978	0,468883	High
std13	Art&Sci	-1,585467351	0,591607978	1,539425	High
std14	Art&Sci	-1,434069938	-0,591607978	0,595711	High
std15	Art&Sci	1,13968608	1,774823935	0,44911	High
std16	Eng	-1,611298348	0,575806507	1,546517	High
std17	Eng	-1,446206304	0,575806507	1,429779	High
std18	Eng	-0,620746085	0,206699772	0,585093	High
std19	Eng	0,369806178	0,575806507	0,145664	High
std20	Eng	0,86508231	0,206699772	-0,46555	Low
std21	Eng	0,369806178	0,575806507	0,145664	High
std22	Eng	0,699990266	0,575806507	-0,08781	Low
std23	Eng	0,461221797	0,51701435	0,039451	High
std24	Eng	0,534096429	-0,591607978	-0,79599	Low
std25	Eng	-2,322581192	-1,06444131	0,889639	High
std26	Eng	-0,60947166	-1,06444131	-0,32171	Low
std27	Eng	1,531915254	-1,06444131	-1,8359	Low
std28	Eng	-0,181194277	-1,855169139	-1,18368	Low
std29	Eng	0,452158929	-0,239762274	-0,48926	Low
std30	Eng	-0,318830014	-1,150858914	-0,58833	Low
std31	Eng	-0,098547459	1,582431006	1,188631	High
std32	Eng	-1,42024279	-0,239762274	0,834726	High
std33	Eng	-1,199960234	0,671334366	1,323205	High
std34	Eng	0,011593819	-1,150858914	-0,82198	Low
std35	Eng	0,782582762	-1,150858914	-1,36715	Low
std36	Eng	0,562300206	-0,239762274	-0,56714	Low

Table A.15: Section based student data for the movie Hannibal.

HANNIBAL					
Student	**Section**	**Mental Effort**	**Performance**	**Efficiency**	**Status**
std1	5	0,919917684	-2,455741776	-2,386951695	Low
std2	5	-0,599496918	0,522756913	0,793553294	High
std3	5	-0,261849228	1,11845665	0,976023647	High
std4	5	-2,456559208	1,11845665	2,527917957	High
std5	5	1,257565373	0,522756913	-0,519588045	Low
std6	5	0,244622305	0,522756913	0,196670867	High
std7	5	0,41344615	0,522756913	0,077294381	High
std8	5	-0,768320762	0,522756913	0,912929779	High
std9	5	1,595213062	-3,051441513	-3,28568096	Low
std10	5	1,426389218	0,522756913	-0,638964531	Low
std11	5	0,751093839	0,522756913	-0,161458589	Low
std12	5	0,41344615	0,522756913	0,077294381	High
std13	5	-1,274792296	0,522756913	1,271059235	High
std15	5	0,41344615	-1,2643423	-1,186375591	Low
std15	5	0,751093839	-0,072942825	-0,582681913	Low
std16	6	-0,074097897	0,363907067	0,30971628	High
std17	6	0,592783175	0,363907067	-0,161839848	Low
std18	6	0,72615939	-0,991333044	-1,214450547	Low
std19	6	-0,340850326	0,363907067	0,498338731	High
std20	6	-0,340850326	0,363907067	0,498338731	High
std21	6	0,192654532	0,363907067	0,121093829	High
std22	6	0,992911819	0,363907067	-0,444773526	Low
std23	7	0,615585975	-1,174779754	-1,265979748	Low
std24	7	-0,643356771	1,140728167	1,261538558	High
std25	7	-0,013885398	1,140728167	0,816435082	High
std26	7	1,245057348	-0,017025794	-0,892427548	Low
std27	7	2,346632251	-0,017025794	-1,671358632	Low
std28	7	1,087689505	-1,174779754	-1,599807355	Low
std29	8	0,704188727	-0,21319721	-0,648689817	Low
std30	8	-0,144090268	1,428421306	1,111933598	High
std31	8	2,037198577	1,428421306	-0,430470536	Low
std32	8	1,310102295	0,607612048	-0,496735617	Low
std33	8	-0,87118655	-0,21319721	0,465268724	High
std34	8	0,340640586	-0,21319721	-0,391622461	Low
std35	8	-0,386455696	0,607612048	0,702912043	High
std36	8	3,127842999	-1,034006468	-2,94287198	Low

Table A.16: Section based student data for the movie Maya.

MAYA					
Student	**Section**	**Mental Effort**	**Performance**	**Efficiency**	**Status**
std1	5	2,897514472	0,746653393	-1,52089	Low
std2	5	-0,299742876	0,746653393	0,739914	High
std3	5	0,659434328	0,746653393	0,061673	High
std4	5	0,339708593	-0,559990045	-0,63618	Low
std5	5	0,819297195	-1,213311764	-1,43727	Low
std6	5	0,659434328	-0,559990045	-0,86226	Low
std7	5	0,339708593	-1,213311764	-1,09815	Low
std8	5	1,618611533	-1,213311764	3,942386	High
std9	5	0,979160063	1,399975112	0,297561	High
std10	5	-0,939194346	0,093331674	0,730106	High
std11	5	0,659434328	0,093331674	-0,4003	Low
std12	5	0,179845726	0,093331674	-0,06117	Low
std13	5	0,179845726	-1,866633482	-1,44708	Low
std15	5	0,819297195	0,746653393	-0,05137	Low
std15	5	0,019982858	-0,559990045	-0,4101	Low
std16	6	0,962361748	1,512702469	0,38915	High
std17	6	0,530809395	0,41654126	-0,0808	Low
std18	6	-2,705833256	-0,67961995	1,432749	High
std19	6	-0,116519135	1,512702469	1,152034	High
std20	6	-0,548071489	2,060783073	1,844739	High
std21	6	0,746585571	0,41654126	-0,23338	Low
std22	6	0,962361748	-0,131539345	-0,7735	Low
std23	7	0,512449277	-0,324927206	-0,59211	Low
std24	7	0,203262004	-0,974781618	-0,833	Low
std25	7	-0,10592527	0,324927206	0,304659	High
std26	7	0,048668367	0,974781618	0,654861	High
std27	7	0,976230187	0,324927206	-0,46054	Low
std28	7	-0,56970618	-1,62463603	-0,74595	Low
std29	8	-0,12887747	-1,595099576	-1,03678	Low
std30	8	-0,12887747	-1,595099576	-1,03678	Low
std31	8	1,398699599	0,081106758	-0,93168	Low
std32	8	0,928675885	0,919209925	-0,00669	Low
std33	8	-1,068924897	0,081106758	0,813195	High
std34	8	-0,011371541	-1,595099576	-1,11986	Low
std35	8	0,928675885	-0,756996409	-1,19195	Low
std36	8	1,28119367	0,919209925	-0,25596	Low

Table A.17: Section based student data for the movie Columbus.

COLUMBUS					
Student	**Section**	**Mental Effort**	**Performance**	**Efficiency**	**Status**
std1	5	2,083212046	-0,124586407	-1,56115	Low
std2	5	1,423909772	0,436052425	-0,69852	Low
std3	5	-0,059520344	-0,68522524	-0,44244	Low
std4	5	0,270130793	-0,124586407	-0,27911	Low
std5	5	-0,718822618	-2,927780571	-1,56197	Low
std6	5	0,270130793	0,436052425	0,117324	High
std7	5	0,270130793	0,996691258	0,513756	High
std8	5	-0,059520344	0,996691258	0,746854	High
std9	5	0,270130793	0,996691258	0,513756	High
std10	5	0,434956361	-0,68522524	-0,79209	Low
std11	5	0,105305224	0,436052425	0,233874	High
std12	5	0,270130793	-0,124586407	-0,27911	Low
std13	5	-0,059520344	0,996691258	0,746854	High
std14	5	0,105305224	-0,124586407	-0,16256	Low
std15	5	0,270130793	-0,124586407	-0,27911	Low
std16	6	0,820118904	0,817692914	-0,00172	Low
std17	6	0,820118904	0,817692914	-0,00172	Low
std18	6	-1,034828145	0,150627642	0,838244	High
std19	6	0,383660775	0,817692914	0,306907	High
std20	6	-0,925713613	-0,51643763	0,289402	High
std21	6	0,383660775	0,817692914	0,306907	High
std22	6	-0,489255483	-0,51643763	-0,01922	Low
std23	7	0,33629573	1,485384425	0,812528	High
std24	7	0,807661055	-0,158633288	-0,68327	Low
std25	7	-0,606434922	0,663375569	0,897892	High
std26	7	1,200465494	-0,980642145	-1,54228	Low
std27	7	0,964782831	-0,980642145	-1,37562	Low
std28	7	0,964782831	-0,980642145	-1,37562	Low
std29	8	-0,425132973	0,512569286	0,663056	High
std30	8	-0,425132973	-0,81408063	-0,27503	Low
std31	8	-0,557798582	0,954785924	1,069559	High
std32	8	0,105529461	0,512569286	0,287821	High
std33	8	-2,017120277	0,512569286	1,788761	High
std34	8	2,095513591	-0,81408063	-2,05739	Low
std35	8	-0,425132973	0,954785924	0,97575	High
std36	8	-0,823129799	0,954785924	1,257176	High

Table A.18: Section based student data for the movie Colonial America.

COLONIAL AMERICA					
Student	**Section**	**Mental Effort**	**Performance**	**Efficiency**	**Status**
std1	5	1,795810475	1,322075381	-0,33498	Low
std2	5	-1,16257703	-0,761194916	0,28382	High
std3	5	0,638180582	1,322075381	0,483587	High
std4	5	-0,648074855	0,627651948	0,902075	High
std5	5	-0,519449311	-0,761194916	-0,17094	Low
std6	5	0,766806126	-0,066771484	-0,58943	Low
std7	5	0,252303951	-0,761194916	-0,71665	Low
std8	5	0,509555038	-0,761194916	-0,89856	Low
std9	5	1,281308301	-1,455618348	-1,9353	Low
std10	5	0,380929495	-0,066771484	-0,31657	Low
std11	5	-1,033951486	-1,455618348	-0,29816	Low
std12	5	1,024057213	0,627651948	-0,2803	Low
std13	5	-0,761194916	0,309470859	-0,75708	Low
std15	5	-0,004947136	0,627651948	0,447315	High
std15	5	1,595726296	0,627651948	-0,68453	Low
std16	6	-0,467858969	0,837820443	0,923255	High
std17	6	-0,467858969	1,922058664	1,689927	High
std18	6	-2,166304973	0,837820443	2,124237	High
std19	6	0,475722145	-1,330655998	-1,2773	Low
std20	6	-0,609396136	0,837820443	1,023337	High
std21	6	0,381364033	-0,246417777	-0,44391	Low
std22	6	-1,419828117	-2,15004178	-0,51634	Low
std23	7	0,4169233	-0,784132521	-0,84927	Low
std24	7	-0,72212334	0,246441649	0,684879	High
std25	7	1,230528042	0,246441649	-0,69585	Low
std26	7	1,067807094	-1,81470669	-2,03825	Low
std27	7	-0,233960494	-0,784132521	-0,38903	Low
std28	7	1,82717152	0,246441649	-1,11774	Low
std29	8	-0,074671114	-0,626859132	-0,39046	Low
std30	8	-0,701458189	-1,339757752	-0,45135	Low
std31	8	0,552115962	0,798938109	0,17453	High
std32	8	-1,641638802	0,798938109	1,725748	High
std33	8	0,552115962	-0,626859132	-0,83366	Low
std34	8	0,552115962	-0,626859132	-0,83366	Low
std35	8	0,552115962	0,086039489	-0,32957	Low
std36	8	1,21807723	0,798938109	-0,29638	Low

Table A.19: Section based student data for the movie Islam.

ISLAM					
Student	**Section**	**Mental Effort**	**Performance**	**Efficiency**	**Status**
std1	5	0,685493842	0,591607978	-0,06639	Low
std2	5	0,534096429	-0,591607978	-0,79599	Low
std3	5	-0,222890636	0,591607978	0,575937	High
std4	5	-0,222890636	0,591607978	0,575937	High
std5	5	1,442480906	-0,591607978	-1,43832	Low
std6	5	1,291083493	-0,591607978	-1,33126	Low
std7	5	1,442480906	-1,774823935	-2,27498	Low
std8	5	1,745275732	0,591607978	-0,81577	Low
std9	5	0,382699016	-0,591607978	-0,68894	Low
std10	5	-0,071493223	0,591607978	0,468883	High
std11	5	0,988288667	0,591607978	-0,2805	Low
std12	5	-0,071493223	0,591607978	0,468883	High
std13	5	-1,585467351	0,591607978	1,539425	High
std15	5	-1,434069938	-0,591607978	0,595711	High
std15	5	1,13968608	1,774823935	0,44911	High
std16	6	-1,611298348	0,575806507	1,546517	High
std17	6	-1,446206304	0,575806507	1,429779	High
std18	6	-0,620746085	0,206699772	0,585093	High
std19	6	0,369806178	0,575806507	0,145664	High
std20	6	0,86508231	0,206699772	-0,46555	Low
std21	6	0,369806178	0,575806507	0,145664	High
std22	6	0,699990266	0,575806507	-0,08781	Low
std23	7	0,461221797	0,51701435	0,039451	High
std24	7	0,534096429	-0,591607978	-0,79599	Low
std25	7	-2,322581192	-1,06444131	0,889639	High
std26	7	-0,60947166	-1,06444131	-0,32171	Low
std27	7	1,531915254	-1,06444131	-1,8359	Low
std28	7	-0,181194277	-1,855169139	-1,18368	Low
std29	8	0,452158929	-0,239762274	-0,48926	Low
std30	8	-0,318830014	-1,150858914	-0,58833	Low
std31	8	-0,098547459	1,582431006	1,188631	High
std32	8	-1,42024279	-0,239762274	0,834726	High
std33	8	-1,199960234	0,671334366	1,323205	High
std34	8	0,011593819	-1,150858914	-0,82198	Low
std35	8	0,782582762	-1,150858914	-1,36715	Low
std36	8	0,562300206	-0,239762274	-0,56714	Low

Table A.20: Section based student data for the movie Galileo.

GALILEO					
Student	**Section**	**Mental Effort**	**Performance**	**Efficiency**	**Status**
std1	5	1,689443601	1,075792999	-0,43392	Low
std2	5	0,132305824	0,007852504	-0,088	Low
std3	5	-0,55975541	1,075792999	1,156507	High
std4	5	-1,424831952	1,075792999	1,768209	High
std5	5	0,997382367	-1,59405824	-1,83243	Low
std6	5	0,132305824	0,007852504	-0,088	Low
std7	5	-0,905786027	1,075792999	1,401188	High
std8	5	1,516428292	0,007852504	-1,06672	Low
std9	5	1,862458909	-1,59405824	-2,44413	Low
std10	5	-0,55975541	-0,526117744	0,023785	High
std11	5	-1,251816644	-0,526117744	0,513147	High
std12	5	-0,732770718	1,075792999	1,278848	High
std13	5	0,132305824	1,075792999	0,667146	High
std15	5	1,689443601	0,007852504	-1,18906	Low
std15	5	0,65135175	1,075792999	0,300125	High
std16	6	0,959952053	-0,262232514	-0,86421	Low
std17	6	0,61020208	0,386447915	-0,15822	Low
std18	6	-0,555631162	1,035128343	1,124837	High
std19	6	-1,954631053	1,035128343	2,114079	High
std20	6	0,027285459	0,386447915	0,253966	High
std21	6	0,61020208	-0,910912942	-1,07559	Low
std22	6	0,027285459	1,035128343	0,712653	High
std23	7	0,082736496	0,654817432	0,404522	High
std24	7	-0,949036283	1,150607774	1,484673	High
std25	7	-0,820064685	-0,336763251	0,341746	High
std26	7	0,598622886	-0,832553592	-1,01199	Low
std27	7	0,727594483	-1,328343934	0,727594	High
std28	7	0,598622886	-1,328343934	-1,36257	Low
std29	8	0,659126225	0,077030477	-0,4116	Low
std30	8	0,160161513	-0,517204629	-0,47897	Low
std31	8	0,326483083	0,671265582	0,243798	High
std32	8	-0,3388032	1,265500688	1,134414	High
std33	8	-2,999948331	0,077030477	2,175753	High
std34	8	1,324412507	-1,111439735	-1,72241	Low
std35	8	0,659126225	-0,517204629	-0,83179	Low
std36	8	0,492804654	-1,705674841	-1,55456	Low

Table A.21: Section based student data for the movie Newton.

NEWTON					
Student	**Section**	**Mental Effort**	**Performance**	**Efficiency**	**Status**
std1	5	-1,585490654	-1,698453106	-0,079876516	Low
std2	5	-0,827822554	-0,970544632	-0,100919749	Low
std3	5	1,31890373	1,21318079	-0,074757408	Low
std4	5	-0,448988504	0,485272316	0,660622161	High
std5	5	0,434957613	1,21318079	0,550286886	High
std6	5	1,066347696	-0,242636158	-0,92559136	Low
std7	5	-0,827822554	-1,698453106	-0,615628767	Low
std8	5	1,824015796	0,485272316	-0,946634593	Low
std9	5	1,571459763	-0,242636158	-1,282759527	Low
std10	5	-0,448988504	-0,242636158	0,145913143	High
std11	5	-0,827822554	-1,698453106	-0,615628767	Low
std12	5	0,687513646	-0,970544632	-1,172424252	Low
std13	5	-1,33293462	-0,970544632	0,256248418	High
std15	5	0,18240158	-0,242636158	-0,300547066	Low
std15	5	0,94006968	0,485272316	-0,3215903	Low
std16	6	1,193583045	-1,324750501	-1,780730728	Low
std17	6	0,039907032	-0,457938445	-0,352029913	Low
std18	6	-0,536930975	-1,324750501	-0,557072529	Low
std19	6	0,296279479	-0,457938445	-0,533312609	Low
std20	6	0,168093256	1,275685668	0,783186105	High
std21	6	0,104000144	0,408873611	0,215578096	High
std22	6	0,616745039	-0,457938445	-0,759915979	Low
std23	7	0,416220418	1,654360577	0,875497302	High
std24	7	0,231233566	0,974891054	0,525845253	High
std25	7	0,138740139	0,295421532	0,110790475	High
std26	7	0,416220418	0,295421532	-0,085417712	Low
std27	7	0,138740139	0,295421532	0,110790475	High
std28	7	0,046246713	-1,742987036	-1,265179317	Low
std29	8	0,945847888	-0,829425535	-1,255307876	Low
std30	8	-0,867981476	0,075402321	0,667073081	High
std31	8	0,286273574	0,980230178	0,490701421	High
std32	8	-0,125960373	1,885058035	1,422004753	High
std33	8	-0,538194319	0,075402321	0,433878345	High
std34	8	0,78095431	-0,829425535	-1,138710509	Low
std35	8	0,451167153	0,075402321	-0,26570586	Low
std36	8	0,203826785	-0,829425535	-0,730619722	Low

APPENDIX B:

Anova test is commonly used to analyze the effect of one or more qualitative variables on a quanitiative outcome variable . It is a "statistical technique for assessing how nominal independent variables influence a continuous dependent variable" (Columbia University, CNMTL) and aims to see if there is any difference between groups on the chosen variable.

There are basically two types of ANOVA that are used in statistical analysis; one-way between groups model and two-way between groups model. One way between groups model is used to analyze the differences between certain groups, it compares the means between groups in question and determines whether any those means are significantly different from each other; where the latter is used to analyze complex groupings.

In cross checkinhg the significance of the variables, gender, section and school in determining the efficiency of the learning environment of History of Civilizations Class of Bahcesehir University 2008-2009 spring smester, one-way ANOVA method was used.

For example, in determining the significance of the students' sections in the efficiency of the learning environment for the movie Hannibal, dependent variable was taken as section, and independent variable, or factor, was taken as the Hannibal.

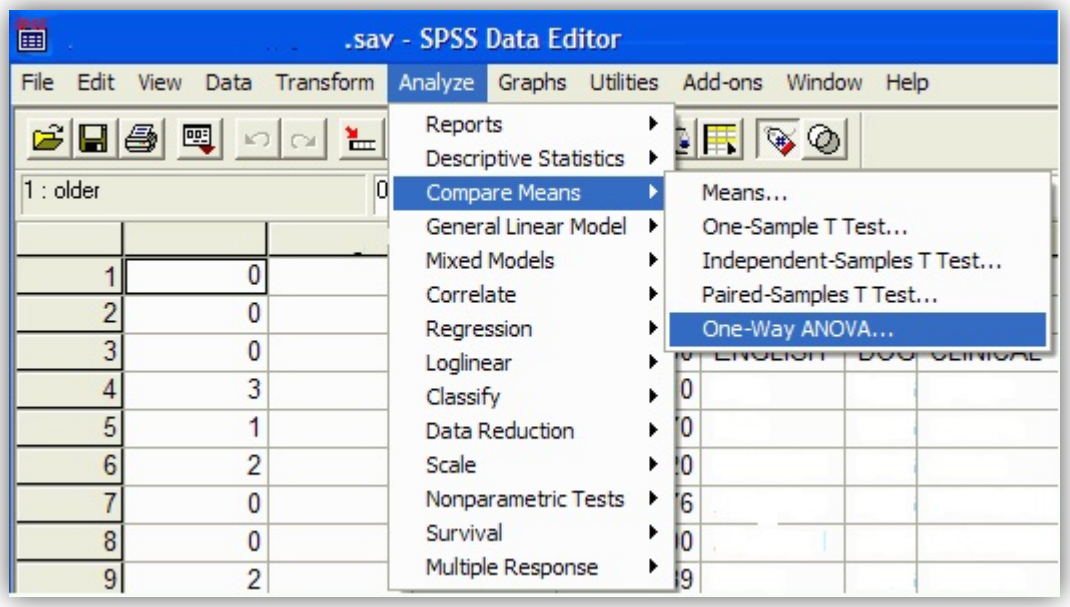

Figure B.1: SPSS Data Editor

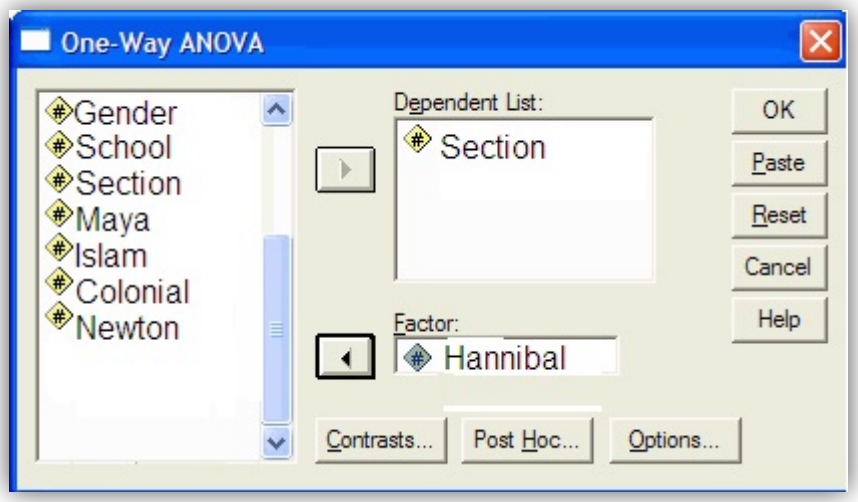

Figure B.2: Configuring Dependent List and Factor

After that, to specify the type of multiple comparison, we clicked on the Post-Hoc button and chose the Tukey test, which will test all possible 2-way comparisons:

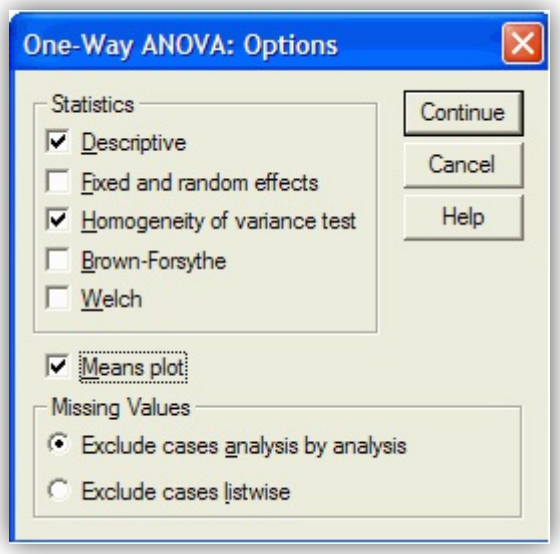

Figure B.3: One-Way ANOVA Options

After that, we returned back to the ONE_way anova dialog box and checked Descriptive to get descriptive statistics about the comparison in question:

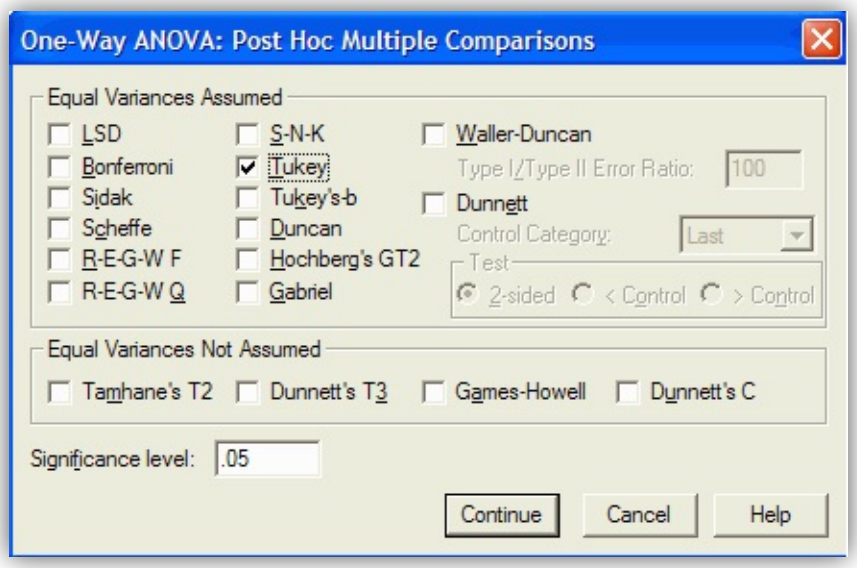

Figure B.4: One-Way ANOVA Multiple Comparison

Finally, we interpret the results according to the ANOVA table output:

Table B.22: SPSS ANOVA table output

Dependent	Variable	Sum of Squares	Df	Mean Square	F	Sig.
Section	Between Groups	6,039	1	6,039	4,046	,047
	Within Groups	158,211	106	1,493		
	Total	164,250	107			

As the significance level was smaller than 0.05, we interpreted that the sections of the students' are important variables in determining the efficiency of the learning environment.

The same prochedure was repeated for cross checking all groupings under the findings section.

CV

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