

# Internals Out-performing Externals in Music Theory Learning: A Cognitive Processing Capacity Perspective

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## Abstract

The purpose of this study was to investigate the effects of locus of control (Internal & external) on the learning of music theory among Jordanian primary pupils. The independent variable was the locus of control (internal & external). The dependent variables were the post test score. An analysis of covariance (ANCOVA) was carried out to examine the main effects of the independent variables on the dependent variable. The findings of this study showed that pupils with internal locus of control pupils performed significantly better than external locus of control pupils.

**Keywords:** Music theory, Cognitive processing capacity, Internal and external

## 1. Introduction

Music theory is the keystone of music and comprises the rules that make music sound good, and enable music to be written and played by musicians (Aldalalah & Fong, 2010a). Therefore, every music learner wishes to know the basics of music theory (Fong & Aldalalah, 2010a). Many scholars such as Nosir (1980) define music theory as the area in which music works are studied. It mainly deals with the language and notion of music where it is composed and interpreted. It assists to categorize the various music patterns and structures experienced in the process of composition throughout genres, styles or during historical periods. According to Chew (2005) music is a language that possesses both universal context and notations. On the other hand, Aldalalah, & Fong (2010b) argues that music provides a unique structure for musicians to reveal their musical concepts. This is because it focuses on music notation is composed in terms of the components of the notation. Also, it involves basic musical concepts that may be observed in forms of the structure, the organization and the history (Smith, 2009). These musical concepts have an important role in establishing the necessary knowledge for interpreting the development stages in music and the mode in which the notation is utilized in various situations. The music theory learning has undergone enormous changes through the past century, including the incorporation of important theoretical contributions, and the arrival of the specialized academic music theorist, have reshaped much of how music theory is taught (Gary, 2000). Cronbach (1957) suggested that optimal learning among a wide range of students requires a wide range of instructional modes or environments that suit the individual pupils' aptitude and learning styles. Aptitude is defined as any individual characteristic that could increase or decrease the pupils' probability of success in music theory learning. Studies conducted by Cronbach (1957), Swanson (1990) and Fong (2000) showed that the learning outcomes of students were indeed better when the modes of instruction were adapted to the pupils aptitude and psychological profiles (Fong & Aldalalah, 2010b). This research investigates the aptitude among pupils of differing internals-externals on the learning of music theory.

## 2. Locus of Control and Learning

Locus of control plays a central role in determining the responses of individuals towards the different stimulus present in the surrounding environment (Shabazz, 2007). Rotter (1966) argues that different individuals have different perspectives for the stimulus surrounding them, thus, their responses vary as a result of these individual

perceptions. Furthermore, individuals have different perceptions towards reinforcement. Some individuals perceive the reinforcement source as internal, while others see it as external (Desimone, 1999). Some people may attribute the consequences of their performance, whether these consequences were positive or negative, to their personal efforts (Fong & Aldalalah, 2010b). Others may attribute the consequences of their performance to luck (Jay, 2007; Rotter, 1990). This phenomenon is known by the locus of control personal trend, which represents one of the generalized and influencing factors on human behavior and achievement (Rotter, 1992; Nunn & Nunn, 1993). Whether these factors were internal or external, they are key factors in determining human learning and achievement (Ormrod, 2000). Melding (1995) and Kalechstein & Nowicki (1997) pointed out that people with internal locus of control expect to acquire reinforcement through their personal efforts and their performance. On the other hand, people with external locus of control expect to acquire their reinforcement through luck or fate (Gifford & Bricelo, 2006). Trusty & Lamp (1997) concluded that adolescents with internal locus of control are generally high achievers, have more favorable attitudes towards school and are more capable of making decisive decisions. Internal locus of control has been found to be one of the key elements in the Attribution Theory, which focuses on determining the factors that direct human behavior. Attribution Theory identifies two kinds of individuals: Those with internal locus of control who attribute their performances, actions and behaviors, whether they were positive or negative, to internal factors such as personal ability and effort (Alth, 2009; Gharaybeh, 2002). The other category is concerned with individuals with external locus of control, who attribute their success or failure to external factors such as luck, fate, chance or the complexity of the task in hand (Autry & Langenbach, 1985). As individuals with internal locus of control have higher levels of self-confidence, they are more independent and better problem solvers compared to external locus of control individuals (Honea, 2006). Driscoll (2005) argues that individuals with internal locus of control report higher motivation level and make independent decisions. Fong (2000) concluded in his study that students with high levels of internal locus of control outperformed their peers with low levels of internal locus of control. Calhoun & Acocella (1990) argued that students with external locus of control are more obedient, easy to persuade, and accept information more easily, but have lower motivation and are at a higher risk of developing depression and helplessness, and are characterized as low achievers (Kelly, 2002). Altah (2009) and Golombok & Fivush (1995) stated that individuals have different self-perceptions concerning their ability to control the life events. Much attention has been paid to the link between locus of control and academic achievement (Chen, 2007; Alharbi, 2006). Several authors have posited the influential impact of locus of control on academic achievement (Nunn & Nunn, 1993). For example, Dembo (1991) confirmed that locus of control is very important for students in the different academic levels. He indicated that most students believe that they control the external factors that determine the success or failure of any task they perform. This personal belief will have negative results on their motivation to perform a certain task. It is expected that students will be more effective if they hold the belief that they are responsible for success or failure, and without taking into account the role of the external factors beyond their control. Nunn & Nunn (1993) indicated that there was a significant negative correlation between locus of control and academic achievement. In other words, levels of external locus of control correlate negatively with academic achievement levels. Anderson, Hattie & Hamilton (2005) asserted in their study the existence of a correlation between locus of control and academic achievement. Several studies have indicated that a high level of external locus of control has more negative effects on students' academic achievement compared to internal locus of control, which is beneficial for the academic achievement (Howerton, Enger & Cabbos, 1992). The results in Brannigan (1991), Park & Kim (1998) and Edmond (2002), confirming the high positive correlation between internal locus of control and academic achievement. Kesici, Sahin & Aktun (2009) concluded in their study that the use of cognitive instructional strategies is more effective among college students reporting high levels of internal locus of control. Young & Uichol (1998) investigated the effects of locus of control tendency, attribution and academic achievement among a sample of high achieving and low achieving Korean and Chinese students. The study concluded that high achieving students have more tendencies toward internal locus of control.

### 3. Cognitive Load Theory

According to Toh (2005) cognitive load theory is one of the theories that is related to mental processes and learning. Cognitive load theory is a set of principles and guidelines to design and deliver instructional environments that promote learning by utilizing the limited capacity of working memory and minimizing working memory overload (Paas, Renkl & Sweller, 2003; Fong & Aldalalah, 2010a). Cognitive load theory assumes a limited working memory capacity that includes partially independent subcomponents for auditory/verbal information and visual information and assumes an unlimited long-term memory capacity holding schemas that vary in their degree of automation (Kalyuga, Ayres, Chandler & Sweller, 2003). Cognitive load theory proposes that many instructional designs are ineffective because they ignore universal and fundamental aspects of cognition (Sweller, 2005). The theory has three components: a cognitive architecture explained by evolutionary principles and specified as a

natural information processing system; a division of cognitive load into three additive categories; and instructional effects that flow from human cognitive architecture and the categories of cognitive load. When processing integrated information, students are able to avoid the extraneous cognitive load imposed when one source of information is held in working memory while searching for its associated referent (Paas, Tuovinen, Tabbers & Van, 2003). In this way, adjacent and mutually referring instructional elements permitted scarce working memory resources to be directed towards constructing schemas rather than searching for the necessary relations between elements. Similarly, in the dual-modal condition, restructuring the same information across two modes facilitated students' schema construction by making available for learning the expanded processing capacity of combined visual and auditory working memories. In contrast, it is assumed that the extraneous cognitive load generated by the split-attention format interfered with learning by imposing an additional, and excessive, load on limited working memory capacity (Paas, Renkl & Sweller, 2004). The total amount of mental activity imposed on working memory in an instance of time is known as cognitive load, which has been found to have three distinct parts (Sweller & Chandler, 1994):

1. Intrinsic load includes the inherent complexity of the subject matter and reflects the level of difficulty of the material to be learned.
2. Extraneous cognitive load is generated by the manner in which information is presented to learners and is under the control of instructional designers. This load can be attributed to the design of the instructional materials.
3. Germane load relates to the effort involved in processing and automating new information. Automation helps overcome working memory limitations and decreases cognitive load.

According to Sweller (2006) cognitive load theory highlights several practices that can be applied to training and performance improvement. The most fundamental of these include methodologies for reducing the effects of the extraneous cognitive load of instructional materials to ensure optimal learning.

#### **4. Methods & Procedures**

##### *4.1 Sample*

The sample consisted of 405 third-grade pupils and was randomly selected from six different primary co-educational schools enrolled in the ALKORAH educational directorate in Irbid Governorate (Jordan) in the second semester for the 2008/2009 academic year. According to Gay & Airasian (2003) "all the individuals in the defined population have equal and independent chance of being selected". The six schools were also randomly selected from the primary schools where music was taught in heterogeneous classes with no grouping or ability tracking.

##### *4.2 Instruments*

- The music achievement test that was administered on the participants of the group in this study is adapted from the music theory competency test developed by the researchers. The music theory competency test consisted of 15 recall (remembering) and 15 understanding items (Refer to Table 1). The music achievement test consists of 30 musical items (Refer to Appendix B). The duration of the achievement music test was 35 minutes. The achievement test comes in the following arrangement: The test is composed of two types of items. The two types of items are based on multiple-choice items for remembering and understanding that are specifically designed to assess learners' music achievement. The stability or what is commonly known as test-retest method is considered the most suitable approach of measuring the reliability that guarantees tests consistency over time (Tuckman, 1999). Nevertheless, this type of reliability has a major problem as to the period of time that should pass between the two testing sessions (Gay & Airasian, 2003). The time that elapses between the two tests was four weeks in order to measure the reliability of the music achievement. The pre-test and post-test given to the sample were the same to maintain consistency. The Music Achievement Test contains 30 items used to evaluate the students' ability to gain what they understood from the lessons and the topics covered in the music theory unit by reporting their learning achievement scores in the test. The focus was on the lower levels of Bloom's taxonomy (remembering and understanding) as shown in Figure 1.

The test addresses remembering and understanding for the students in third primary grade, where the test covers the contents of the music theory unit used for this grade. Table (1) shows the distribution targets in the cognitive test.

Table 2 summarizes the difficulty index and discrimination index of the 30 test items respectively. The items with a difficulty index of less than 0.30 and more than 0.80 (marked as \*\*) were removed from the pre-test and post-test.

Items with a discrimination index of less than 0.40 were also removed (marked as \*). After reviewing the items, 30 items were chosen for the final test copy.

The difficulty index is obtained through Equation 1 below:

$$D = \frac{X}{N} \times 100 \quad \text{Equation (1)}$$

where D = Difficulty Index.

X = The number of pupils who have correct answers.

N = Total number of pupils.

The discrimination index is extracted through Equation (2) below:

$$D = \frac{X - Y}{N} \quad \text{Equation (2)}$$

where D = Discrimination Index

X = The number of pupils who have correct answers (high group).

Y = The number of pupils who have correct answers (low group)

N = Total number of pupils.

(a) Arrangement of pupils' marks (ascending order).

Divide the pupils' marks into two groups (high and low)

High: the highest 27%

Low: the lowest 27%

To ensure the reliability of the music achievement test, the researchers checked the reliability of the instrument with a Test-Retest (Tuckman, 1999) where it was applied on the pilot study samples. The 30 items were divided into two parts; the reliability of the test questions was calculated using the Cronbach Alpha procedure to calculate the internal consistency. The Cronbach Alpha of the first and second parts was 0.81 and 0.82 respectively. The Cronbach Alpha of the test was 0.80. All of them were found to be reliable. The internal consistency of the first part was 0.86 and that of the second part was 0.88. Overall, internal consistency of the parts was 0.93.

- Locus of Control Questionnaire: This questionnaire, the Intellectual Achievement Responsibility, is a measure of the locus of control for pupils, measuring acceptance of responsibility for academic success (ARI+) and academic failure (ARI-). This instrument was prepared by Thornton (1985). The test consists of 34 items yielding the description of internal locus of control (ability and effort) versus external locus of control (parents, teacher, etc.) factors which affect the outcomes. Each item describes intellectual success or failure situation. The item is followed by one alternative that implies the students' responsibility and another that implies the responsibility of someone else. The duration of the Locus of Control Scale is 30 minutes.

The total score of the Locus of Control questionnaire test is 34. Pupils received a score of "1" for an internal answer and a score of "0" for an external answer or for the case of no answer on each item. The Locus of Control pupils were divided into two levels: External and Internal. The levels are identified based on the following equation:

$$Z = \frac{\text{Highest Mark} - \text{Lowest Mark}}{\text{Number of Levels}}$$

Where Hmin = Highest Mark

Lmin = Lowest Mark

Z = The difference between one level and the other.

E = External, I = Internal

E (range) = [Lmin - Lmin + Z]

$$I(\text{range}) = (L_{\min} + Z - L_{\min} + 2Z)$$

Highest Mark = 33, Lowest Mark = 0, Number of Levels = 2

$$Z = \frac{33 - 0}{2} = 16.5$$

$$E(\text{range}) = [0 - 16.5]$$

$$I(\text{range}) = (17 - 33)$$

The reliability coefficient of this instrument (The Arabic version) was computed by the implementation of Cronbach Alpha whereby it was 0.84 for the whole scale. The internal consistency in this instrument (Arabic version) was 0.86.

- **Instruments Validity:** Validity of the instruments are important aspects that should be taken into account when conducting a research. Validity consists of two different aspects that is face and content validity. According to Gay and Airasian (200) face validity relates to "the degree to which a test appears to measure what it claims to measure". Face validity was judged by a panel of experts in the field of education and music. Content validity refers to the "degree to which a test measures an intended content area (Gay & Airasian, 200). Content validity of the instruments in this research was justified by the panel. The feedback and comments received from the panel of experts were employed to establish the necessary clarifications, changes, and modifications before and after piloting the study.

#### 4.3 Instructional Materials

The topic to be covered is the music theory in the music subject for the third grade primary pupils in the Kingdom of Jordan. The topic was developed taking into consideration the emphasis on a knowledge-economy which is the current goal of the Jordanian Ministry of Education in all fields of primary education. And since music is one of the emerging subjects that need improvement in Jordan, it was necessary to conduct an in-depth research into the subject and to develop relevant teaching materials for music. The educational program included a unit of the music book in third grade. The basic unit of music theory is based on teaching theories of music only. It identifies and teaches reading and writing of music. This unit includes: Semibreve, Minim, Crotchet, Quaver, Semibreve rest, Minim rest, Crotchet rest, Quaver rest, Stave, Clef, and Tones.

#### 4.4 Research Variables

The present research contains three types of variables (independent, dependent and moderating variables) that are presented as follows:

- Independent Variable

Locus of Control (Internal, External)

- Dependent Variable

Post Test Score (Music Theory Learning)

### 5. Results

The analyses of the collected data were carried out through various statistical techniques such as the ANCOVA. The data were compiled and analyzed using the Statistical Package for the Social Science (SPSS 16) for Windows computer software.

#### 5.1 Description of the Post-test Scores of Pupils with Different Levels of Locus of Control (I & E)

A comparison was made between the two groups - pupils with internal locus of control level and pupils with external locus of control level (I & E) - based on the means of the post-test scores using the descriptive procedure (Table 3). From table 3 it can be seen the post-test score mean ( $M = 20.18$ ) for the internal locus of control group is higher than the post-test score mean ( $M = 19.07$ ) for the external locus of control group.

#### 5.2 ANCOVA of the Post-test Scores of Pupils with Different Levels of Locus of Control (I & E)

In order to reduce the statistical error, the pre-test scores were used as the covariate, and a comparison was made among pupils with different levels of locus of control (I & E) using the ANCOVA procedure (Table 4).

The values  $F(1, 402) = 8.931$ , Mean Square = 160.958, and  $p = .003$  show a significant difference between the post-test scores of pupils with different levels of locus of control (I & E).

## 6. Discussion

Generally, internal locus of control pupils achieved higher post-test scores compared to external locus of control pupils regardless of the treatment mode. This finding is consistent with the study by Park & Kim (1998) regarding the relationship between locus of control and student academic achievement. The empirical study conducted by Kesici, Sahin & Akturk (2009) showed a significant impact of internal locus of control on student academic achievement. As expected internal locus of control pupils outperformed external locus of control pupils across the treatment mode. The study by Anderson, Hattie & Hamilton (2005) reported that internal locus of control students achieved better performance compared to external locus of control student in the learning of structure and cell function. Trusty & Lampe (1997) found that internalized locus of control adolescents were high achievers, less reluctant to play truant from school, and more effective decision-makers. Results from Fong (2000) showed that students with higher internalized locus of control outperformed their counterparts with low internalized locus of control. This result received support from Kelly (2000) who indicated that early grade children with internalized locus of control outperformed their peers with externalized locus of control in homework assignments. Gharaibeh (2002) conducted a study that aimed at exploring the effect of locus of control on achievement levels in Irbid City schools (Jordan). The study found that low achievers tended to be of external locus of control. Along the same lines, Edmonds (2002) investigated the effect of locus of control on achievement among eighth grade students in Virginia. The study found varied achievement levels among students and differences were in favor of internal locus of control students rather than external locus of control students. There are several possible reasons for these results. According to Jay (2007) internal locus of control pupils will achieve high achievements due to their persistent involvement in their learning. The internal locus of control pupils assume personal responsibility on their actions as they are conscious to their ability to control many factors related to their academic achievement and general performance. Therefore, pupils with internal locus of control believe they can take control of and change events by their actions, so they view their ability and efficiency as the major determinant of the results of a task.

On the other hand external locus of control pupils disregards such factors relating to ability, effort, and skills in creating success and avoiding failure. They most often would attribute either failure or success to others. And the essential determinant of their achievement results is luck and destiny, and because of such uncontrollable factors they consider it futile to exert any effort to achieve such tasks, thereby they would have negative expectations of performance results in any future task.

Working memory refers to the structure and processes used for temporarily storing and manipulating information. The information from sensory memory is processed in the working memory. It is generally considered to have limited capacity. According to Sweller (2005), the processing of information simultaneously is even more limited with the working memory only being able to process two to four elements at any one time. Working memory, sometimes referred to as short-term memory, is often equated with consciousness. Once attended to by the learner, information can move from the sensory memory subsystem to the working memory subsystem. The processing that occurs within the working memory is an active and conscious event unlike the passivity of the sensory memory. Mayer's theory of multimedia learning suggests that meaningful learning occurs when a learner retains relevant information in each store, organizes the information in each store into a coherent representation, and makes connections between corresponding representations in each store, analogous to the cognitive processes of selecting, organizing, and integrating in, and connections can be made only if corresponding pictorial and verbal information is in working memory at the same time. Due to the restrictive nature of the working memory's capacity to deal with information, it is of paramount importance that the cognitive load be managed in such a way that it enables optimal learning and understanding. The working memory can become easily overloaded when instructional material is not presented in a manner that takes its limitations into account. When working memory becomes overloaded, information cannot be processed and stored adequately to enable learning or understanding.

A pupil with a poor working memory capacity may have delayed learning of music theory. Further the pupils with internal locus of control can process and realigns information better and that helps maintain information retention and storage in the long-term memory. The pupils' lack of competency in music could be contributing to the increased mental effort. As described earlier, the results from this study showed a strong negative correlation between learning and locus of control. Pupils with external locus of control performed more poorly on the post-test scores. If the external locus of control pupils does indeed have lower levels of information processing, then, their greater mental effort scores reflect an increased cognitive load for a lack of low achievement.

## 7. Conclusion

The current study supply some evidence of the function played by locus of control and cognitive load in music theory learning, with particular emphasis on the relationship between cognitive lode and locus of control.

Apparently, external locus of control pupils has smaller and limited working memory, to accommodate and integrate incoming information. Hence the performances of the external locus of control pupils are low. The researchers recommend that more studies be conducted to determine other factors that might be affecting this phenomenon.

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Table 1. Specifics for Musical Theories Test

Subjects	Question, Marks, Question Number	Special objectives (Bloom’s pyramid of experience)		Total Questions	Total Marks	Percentage %
		Remembering	Understanding			
Note lengths	Question	3	3	6	6	20%
	Marks	3	3			
	Question Number	(4),(5),(13)	(3),(4),(7)			
Reset	Question	3	3	6	6	20%
	Marks	3	3			
	Question Number	(2),(9),(10)	(2),(10),(12),			
Stave	Question	2	2	4	4	13.33%
	Marks	2	2			
	Question Number	(11),(15)	(1),(15)			
Clef	Question	1	1	2	2	6.66%
	Marks	1	1			
	Question Number	(3)	(6)			
Tones	Question	6	6	12	12	40%
	Marks	6	6			
	Question Number	(1),(6),(7),(8),(12),(14)	(5),(8),(9),(11),(13),(14)			
Total questions		15	15	30	30	100%
Total Marks		15	15			
Percentage %		50%	50%			

Table 2. Item Analysis of the Pilot Test (Music Achievement Test)

Dimension	Item	Difficulty Index	Discrimination Index
Remembering	1	0.63	0.89
	2	0.35	0.52
	3	0.57	0.75
	4	0.65	0.78
	5	0.36	0.70
	6	0.33	0.49
	7	0.41	0.52
	8	0.42	0.45
	9	0.65	0.71
	10	0.59	0.87
	11	0.35	0.80
	12	0.31	0.61
	13	0.66	0.84
	14	0.32	0.52
	15	0.63	0.82
Understanding	16	0.32	0.52
	17	0.63	0.64
	18	0.64	0.73
	19	0.41	0.61
	20	0.63	0.91
	21	0.59	0.94
	22	0.35	0.78
	23	0.31	0.61
	24	0.66	0.85
	25	0.32	0.52
	26	0.63	0.89
	27	0.32	0.52
	28	0.63	0.66
	29	0.64	0.98
	30	0.41	0.56

Table 3. Post-test Score of Pupils with Different Levels Of Locus of Control (I &amp; E)

Locus of control	Mean	Std. Deviation	N
Internal	20.1864	5.67036	118
External	19.0767	5.39759	287
Total	19.4000	5.49464	405

Table 4. ANCOVA of the Post-test Scores of Pupils with Different Levels of Locus of Control (I &amp; E)

Source	Type III Sum of				
	Squares	df	Mean Square	F	Sig.
Corrected Model	4951.962 <sup>a</sup>	2	2475.981	137.379	.000
Intercept	638.231	1	638.231	35.412	.000
Pre-test	4848.974	1	4848.974	269.044	.000
Locus of Control	160.958	1	160.958	8.931	.003
Error	7245.238	402	18.023		
Total	164623.000	405			
Corrected Total	12197.200	404			

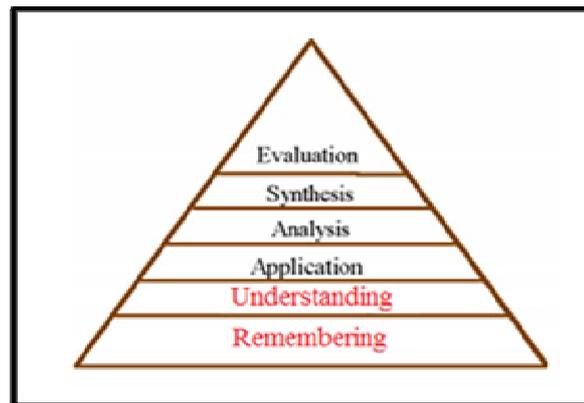


Figure 1. Bloom's Taxonomy