

*An investigation into the influence of learning environments,  
attitudes, perceptions and environmental factors on task  
performance: A study of Irish secondary school students*

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## *Abstract*

*Objective:* This study aimed to determine if there is a difference in levels of performance of children taught in prefabs and classrooms. Furthermore, to determine a relationship between attitudes, perceptions and environmental factors with task performance. An abundance of research has shown the environment in which a child learns is central to their performance also a room of poor architecture has a negative impact on their performance. Therefore conducting this research will fill a gap in the research determining if the prefab environment has a negative impact on one's task performance. *Methods:* This study consisted of 54 participants, 51 students and 3 teachers. Participants were of mixed ability and split according to which of the three environments they learned in; classroom, old prefab, new prefab. Participants were assessed in task performance, attitudes and perceptions. Environmental readings were measured in terms of noise and temperature. Participants took part in the trail making test to measure performance. *Results:* Descriptive statistics indicated a difference in task performance between the three environments although the difference was non-significant. Additionally, attitudes and perceptions did not have a relationship with performance. However, the environment temperature is drastically colder in the new prefab as opposed to the classroom. Also both teachers and students reported a negative attitude towards the prefab, preferring the classroom. *Conclusion:* Findings of this study determine that although task performance does not have a significant difference within the three environments it may be due to there not being enough power therefore a type two error may be the result of failure to meet significant a result. Additionally, both teachers and students have a negative attitude towards prefabs. Therefore, further research should be conducted to determine the underlying cause and impacts of these attitudes.

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## *Introduction*

Learning can be defined as a change occurring from an experience considered being relatively permanent, and cannot be applied to temporary states such as illness (Olsen, 2014). LeFrancois (2013) believes that it is experience in which we interact with causes us to learn, thus resulting in a change of behaviour. A considerable amount of research has been conducted in the area of education and psychology regarding the way in which one learns, for example; Kohler (1925) believed that an individual learns through the process of insight. Kohler described the term insight as a moment of realisation by an individual. Bandura (1977) on the contrary believed that in order for learning to occur, children use the process of imitation. In order to explain this Bandura proposed the social learning theory.

Within this theory he stated that a child learns through observing the actions of adults around them. Bandura effectively demonstrated his theory with the use of the BoBo doll. In his experiment children observed adults being either pleasant or aggressive to the doll. Results concluded that the children who experienced the aggression rein acted what they experienced. However, Kolb (2014) felt that learning occurs through experience that occurs in one's life. Although he does not believe that this is an additional theory of learning to those of cognitive and behavioural, rather, he believes that this builds upon thus connecting experience, perception, cognition and behaviour. Albeit there is an abundance of research concerning how an individual learns, there is limited amount of research regarding where one learns best in terms of environmental factors and how these factors may influence one's overall performance.

Hebb (1949) was one of the first theorists to discover that enriched environments have an impact on the brain. He found that rats that were blinded in infancy as opposed to adulthood experienced more cognitive impairment. In light of this finding he controlled for enriched environments by analysing the growth of cognitive development in laboratory rats and house pet rats. His results concluded that the house pet rats have a far greater increase in brain functioning, thus supporting his initial theory. Eckert and Abraham (2012) also supported this concept proposed by Hebb as with the use of data collected from in vivo recordings of the hippocampus which were made during and after the enriched environment treatment showed an early increase in cell activity and plasticity, giving rise to more subtle enhancements in the long-term.

With this information in mind Faverjon, Silveira Fu, Cha, Akman, Hu, and Holmes, (2002) found that an environment may be considered enriched when it has “complex, inanimate and social stimulation”. Kobayashi, Ohashi, and Ando (2002) also supported traditional research views, which stated that that task performance will be considerably improved if the task is conducted in an environment which is considered to be one of enrichment. Kobayashi, Ohashi and Ando conducted a study examining the level of task performance on rats to support the idea that they proposed. Within their study they had two groups, the first group consisted of male rats in an enriched environment and the second group consisted of male rats a non-enriched environment. Results indicated that the rats that performed a task in the enriched environment had performed better in the task compared to the rats that did the task in the non-enriched environment. Although a lot focus has been drawn to enriched environments and how they are necessary to promote learning and performance, the vast majority of this research and literature has



been devoted to animal studies therefore it cannot be directly inferred as having the exact same result on a human brain as it does on a rat.

However, Alwis and Rajan (2014) conducted an analysis to determine the impact of enriched environments on adults who experienced brain damage and adults that did not. Within their analysis they reviewed previous literature such as Hu and colleagues (2010). They discovered that individuals suffering from Alzheimer's disease immensely benefitted from enriched environments. Within their study they discovered that enriched environments enhanced neuronal survival and maturation thus, improved cognition is developed. However, Alwis and Rajan concluded that although enriched environments have been seen as improving the overall cognitive functioning of individuals and animals with brain damage it cannot be wholeheartedly supported. This is due to that fact that the amount of enrichment required is unknown, therefore making it almost impossible to standardise it as a therapeutic tool for individuals who have experienced brain damage.

It is evident that a vast amount of research has been conducted regarding the impact of enriched environments on one's learning, however, there has been very little, dated research conducted concerning architecture and how this may affect learning and performance. Tanner (2000) stated that although the education system has focused on introducing new technologies such as; the interactive whiteboard within the school environment to promote learning through enrichment, the architecture of the building has been completely disregarded. In support of this Strichez (2000) found that students performance is seen to be lower in old 'shabby' buildings, however, it has not been shown that their performance will rise if new equipment is put in place. Thus, making it reasonable to suggest that the Governments attention may potentially be focused on the

incorrect element when concerned with the improvement of learning and that more focus needs to be spent on the architecture in which the children learn rather than the equipment such as interactive white boards.

Research has found that children have better performance, attention and attendance in newer buildings as opposed to old (O'Neil & Oates, 2001) and that being in an old school that cannot control environmental factors such as temperature, light and noise can pose as stressors to a child, thus, affecting school success (Evans & Kantrowitz, 2002). O'Neil and Oates concluded the findings of lower attendance, attention and performance occurs as a result of children learning in older buildings as opposed to newer. They came to this conclusion in their study through the use of a questionnaire in which they asked parents opinions as to what was an essential requirement within a school. Parents perceived a school which is of modern design will improve a child's attendance, achievement and attention. Although they found this to be the common consensus among parents, results are of a self report and a matter of opinion by the parents who are not present within the class. Therefore results cannot be taken entirely at face value. Evans and Kantrowitz (2002) found that in terms of the school environment ambient noise alleviates a child's blood pressure and stress hormone. Thus, posing as a stressor and affecting school success. This study however was of correlation nature therefore there may be an additional factor impacting task performance rather than noise.

While there is no official report published with official statistics of the number of temporary accommodations such as prefabs used in Ireland. However, according to the minister of education – Ruairí Quinn, it has been reported that due to the boom in children attending primary and secondary schools the solution was to put in place

“temporary” accommodation such as prefabs. At the end of March in 2013 it was reported that there were 1,273 prefab buildings in use. The use of the 1,273 prefabs has cost the state a reported €17.5 million per year. Ruairí Quinn also stated that the removal of these temporary accommodations and to build permanent traditional classrooms will not only save the state millions but will provide modern and high quality learning environments for students and teachers alike.

According to Lyons (2001), 40% of schools promote conditions that are not appropriate such as noise, light, temperature and chair layout. Lyons also points out that poor design of schools could cause poor temperature regulation and natural light may be affected, this in itself can hinder one’s learning and performance. Likewise, research has suggested the importance of controlling environmental factors such as temperature and noise as they have been shown to have a direct impact on a student’s attention, learning and task performance. However, Ofsted (2001) found that almost a quarter of secondary schools are not achieving this control over the environmental factors.

### **Temperature**

Regarding temperature an ample amount of research has been conducted to show its impact whether positive or negative on task performance, attention and learning.

Earthman (2004) regards temperature as one of the most important factors to promote educational achievement. It has been said that the optimal room temperature in which a student is most comfortable and will excel most in is between 20 and 24 degrees Celsius (Earthman, 2002). Fung and Leung (2005) stated that temperature has a great impact on thermal comfort which affects one’s attention, performance and learning.

It has been shown that if one is exposed to acute cold it impairs their memory and reasoning in subsequent cognitive tasks (Pilcher & Nadler, 2002). Indoor environmental quality has been shown to have an important impact on achievement. In support of this, research has also clearly indicated that poor indoor environment quality such; as a lack of control of thermal conditions has a negative impact on task performance (Mendell & Heath, 2005). Pilcher, Nadler and Busch (2002) carried out a study to determine the impact of hot and cold temperatures on performance in an educational setting. Results concluded that a temperature of 32 degrees Celsius was deemed as having a negative impact on performance; in contrast, the cooler environment with a temperature of 10 degrees Celsius also had a negative effect on performance as opposed to a neutral environment.

Likewise, Makinen and colleagues (2006) measured cognitive functioning over a 10 day period in relation to individuals being in a control environment (25 degrees Celsius) or the cold environment (10 degrees Celsius). Individuals were exposed to these conditions for 10 days and were required to partake in a battery of cognitive tests. Following the 10 day incubation, results evidently supported previous research as it showed that the cold temperature has a negative impact on cognitive performance in relation to performance time. This is due to the fact that shivering poses as a distraction thus; more attention is required to perform better on the task. However, this study consists of a small sample size therefore, this may impact the results due to lack of sufficient power. Hocking and Colleagues (2001) monitored soldiers who were experiencing excessive heat during their service in different terrains, their results indicated that the soldiers had a significant decrease in working memory, information processing and information retention due to the excessive heat in which they were exposed to. However these battery's of tests were

conducted on a small sample. Although results were significant the sample itself was not a representative sample due to its miniscule size.

In contrast alternative studies have been conducted and suggested there to be little to no effect to reasoning and working memory as a result of an extreme temperature. It has been suggested that the differences in results may be due to a number of confounding factors such as attitudes, motivation and data collection (Gaoua, 2010). Baddeley and colleagues (1975) carried out a study in which divers were exposed to water for one hour in temperatures of 25.6 degrees Celsius or 4.4 degrees Celsius. Results contradict previous research as it clearly shows that through the use of reasoning tasks, the divers in the cold condition did not experience deterioration in this cognitive function.

Similarly, Amos and colleagues (2000) monitored the physical and cognitive ability of soldiers, who were serving in conditions of 38.4 degrees Celsius. Throughout the monitoring of the soldiers during operational tasks it was clearly seen that there was no impairment on the soldiers cognitive functioning, even in extreme heat. The difference in results of these two studies as opposed to other previous studies could be a result of confounding variables such as motivation. This is reasonable to suggest as both of the samples in each study are highly trained. One being highly trained divers who are trained to withstand extreme coldness, likewise the other has trained soldiers who generally serve in hot terrains. Therefore if non-trained individuals were part of this experiment results may be significantly different.

### **Noise**

As previously stated noise can pose as a stressor to an individual, thus having an impact on their school success (Evans & Kantrowitz, 2002). It is also very evident that the

impact of noise on performance is still considered a hot topic and widely researched throughout the world today (Hygge & Evans, 2007). Similar to temperature, noise has also been deemed as an extreme environmental factor that has a negative impact and is said to be a hindrance on one's task performance, thus affecting overall learning (Stansfeld & Matheson, 2003). A profuse amount research has been conducted within the field of psychology in order to determine the impact of noise on one's performance. Chiang and Lai (2008) implemented a study in which they discovered evidence supporting previous research findings which stated the impact of design and environmental factors on learning and performance. Their results indicated how noise has a substantial impact on one's performance and learning, thus proving its hindrance to success. Not only did they find it to be a hindrance on the student's performance, they also found it to be negative on their health.

DiSarno and colleagues (2002) also found that noise within an environment could drastically affect a child's comprehension and task performance skills as young children have not yet fully developed their oral, written and comprehension skills (Mills, 1975) and therefore, noise distracts the child and negatively affects the process of obtaining and performing such skills (Stone, 2001). Zannin and Marcon (2007) performed a qualitative study in which they reported from the interviews with the children and the teachers that the level of noise in classrooms especially classrooms that are adjoining and only separated by a thin board can often be distracting and deemed as interference on one's performance in class tasks. However, this study is of interview based therefore results must be considered with an air of caution as participants may have answered in the way in which they felt the researcher wanted them to, thus the findings may be inaccurate.

Dockrell and Shield (2006) carried out a study to show the impact of noise in the classroom on a child's performance. They randomly assigned the children into either a quiet classroom, a classroom full of chat or a classroom with excessive environmental noise such as cars. Results concluded that the children who were in the classroom with the presence of environmental noises performed significantly worse than the children in the quiet class and the class full of chat. However, this study is a between groups study. As a result the variations in performance may be as a result of individual differences rather than the noise of the classroom.

Similarly, research has also indicated that exposure to acute noise disruptions causes a decline in performance in listening comprehensions and speech perception (Klatt, Lachmann & Bergstrom, 2013). Hygge, Ljung and Sorqvist (2009) analysed the impact of road noise adjacent to schools on one's reading speed, reading comprehension, basic mathematics and mathematic reasoning. Results concluded that the motor noise caused by traffic on the adjacent road had a negative impact on basic mathematics and reading speed. Thus, it can be said that this form of external noise poses as a distraction.

However, in contrast to previous research it did not show to affect reading comprehension. This difference in result may be due to the fact that the age group or motivations of the children were different. Background speech has been shown to have a negative impact on a child's reading skills as it consumes their attention (Klatte, Meis, Sukowski, 2007).

This result is different to that of Klatt, Lachmann and Bergstrom (2013) as they found that in comparison of the different conditions the children in the classroom full of chat had better task performance than those in the classroom with an excessive amount of environmental noise. Clark and Sorqvist (2007) reviewed the impact of noise on

attention over a three year span. In conclusion of their review they found that noise impacts one's performance due to it posing a cause of distraction. They discovered that noise causes this negative impact through either noise capturing one's attention, thus, taking their focus off the task or an inference between processes.

However, in contrast research has indicated that individuals may not experience a negative impact of noise on their task performance. This may be due to individual differences (Belojevic, Jakovljevic & Slepcevic, 2003). Within a field study Belojevic, Jakovljevic and Slepcevic conducted, they exposed participants to a noisy environment and provided a task to measure the individual's performance. Their results concluded that individuals were affected by the noise depending on their personality type.

Therefore, it can be suggested that this result may be the cause of previous discrepancies in alternative research findings. It is also evident that individual factors may be the cause of a difference in results. This can be seen when comparing results of previous research as DiSarno and colleagues (2002) who found that external noise has a negative impact on comprehension skills, however, Hygge, Ljung and Sorqvist (2009) found that noise does not have an impact on reading comprehension it only has an impact on reading speed.

### **Attitudes**

Individual's attitudes have been an area of interest over the years especially in the fields of personality and developmental psychology. However, research concerning attitudes towards educational environment and educational achievement is relatively limited.

Aiken and Dreger (1961) conducted a study in which freshman students completed the math attitude scale and their academic results were also used to compare with the



attitude scale. They found that attitudes impacted the performance in for female participants but did not have an impact on males.

In contrast, Hilal (2000) conducted a study to determine the impact of one's attitudes towards schooling on their educational achievement and task performance. Results concluded that attitudes have an effect on academic achievement and task performance for both males and females. However, they found that although attitudes were seen to have an effect on academic achievement and task performance it was only an indirect effect. Their results concluded that level of aspiration had a more direct effect. This contrast in result between the two studies may be as a result of the sample in which Aiken and Dreger used. Within their study the sample consisted solely of freshman students therefore age may be an important factor and may be the cause of the fluctuation within results.

Additionally, Lumsden (1994) stated that student's attitude has an impact on their school achievement. Afari and colleagues (2013) supported this as they developed a scale to measure the impact of a student's attitude towards the mathematics environment and how this impacted achievement. Results concluded that the children with a positive attitude resulted in greater success when a creative way of teaching maths such as games was implemented. Therefore they found in order to increase the academic performance in maths is to improve one's attitude towards it. However, the sample size within this study is of a relatively small size therefore the sample size may have skewed results and a larger more representative sample may cause a change in results. Amos and colleagues (2000) also discovered contradictory research in terms of the impact of temperature on performance. As previously mentioned excessive temperature whether that be too hot or too cold has a negative impact on one's cognitive ability.

However, Amos and colleagues (2000) discovered that the soldiers who served in terrains of 38.2 degrees Celsius did not experience a decrease in their performance due to their motivation and good attitudes. Thus, indicating that attitudes have an impact on performance. Results concerning the impact of attitudes on educational achievement are relatively limited and contradictory.

However, research has indicated that the attitudes in which a teacher possesses has an impact on student achievement. Goodman (2016) conducted a study to determine the impact of teacher's attitudes on student's academic achievement. The findings concluded that teaching based practices that promoted positive attitudes promised the best academic achievement in students. These findings were discovered through conducting a qualitative study using Bandura's Self-Efficacy theory. Although findings show an effect there may not be an effect if the study was replicated in a different environment as all students within this study were from a disadvantaged area therefore they may potentially rely more on their teachers support and attitudes rather than students from an advantaged environment.

### **Current Study**

With reference to the research presented above, it is therefore reasonable to state that environmental and personal factors have been shown to have an impact on task performance. (Lyons, 2001) However, alternative previous research has stated that although there may be an effect on task performance it may not be a direct effect and may be as a result of alternative factors such as attitudes, personality or motivation (Gaoua, 2010; Amos et al, 2000). At present, there is growing research to suggest that temperature and noise have an impact on task performance (Evans & Kantrowitz, 2002).

However, the research that has been conducted is primarily in relation to a traditional classroom setting (Klatt, Lachmann and Bergstrom, 2013; Zannin and Marcon, 2007).

Furthermore the results of previous research findings may not be applicable to the students who are taught in a temporary learning environment that is the prefab.

Therefore in light of previous research which states that the architecture of buildings has an impact on task performance it is necessary to discover if the temporary

accommodation poses as poor architecture in terms of its temperature control as previous research has stated that extreme temperatures have an impact on performance.

Therefore, the main objective and rationale of conducting a study of this kind is to assess task performance in relation in temperature, noise and attitudes in the temporary

learning environment such as a prefab as opposed to the traditional classroom as a result of the overcrowding of schools. It is essential to conduct this study as it is one of the

first of its kind as all previous research assessing the impact of attitudes, architecture, temperature and noise are all conducted in relation to a traditional classroom setting.

Therefore as a result of over-crowding a vast majority of individuals are taught in the temporary accommodations therefore research is required to determine if these

environments pose as a threat to their overall learning with respect to environmental control, attitudes and perceptions.

As previously seen the current expenditure on these alternative learning environments is of a staggering €17.5 million per year. Therefore it is vital to conduct a study of this

kind to determine if expenditure of this amount is detrimental to the economy and the students learning performance as an excessive amount of students are currently taught at

least one subject in such environments due to lack of classroom space (Quinn, 2013).

This research will pose a benefit to society and the educational system due to the fact that a majority of children have been taught in environments other than a classroom. Also it is beneficial to conduct a study of this kind as previous research for example, Afari and colleagues (2013) consisted of a small sample size. Therefore the results may be skewed and may not be a representative sample. A study of this kind has not yet been considered; therefore it will play a key role in the future education system.

### **Aims and objectives**

The general objective of this study is to examine student's task performance and attitudes in both a traditional classroom environment and the temporary accommodation.

### **Hypotheses:**

- i. Task performance will differ in each of the learning environments. Specifically, the prefabs will have lower levels of task performance than that of classrooms.
- ii. Temperature and noise will have a relationship with task performance.
- iii. The attitudes the child holds of their current learning environment will have a relationship with their task performance.
- iv. The child's perception of their environment will have a relationship with attitudes and it will have a relationship with performance.

### **Aims:**

- i. To explore the teacher's attitudes towards teaching within a prefab as opposed to a classroom.

- ii. To discover if prefabs and classrooms differ in terms of their levels of noise and temperature.

## **Method**

### **Participants**

The sample of the current study consisted of 51 participants, comprising of 24 males (47.1%) and 27 females (52.9%). The participants within this study were recruited from a second year class in a secondary school based in a suburban town on the outskirts of Dublin City. The sample consisted of a group of 13 and 14 year old students of mixed ability and nationality. Participants were obtained through the use of convenience sampling in an opportunistic approach. As a result of the participants being under the age of 18 it was required to obtain consent from their parents/guardians in order for their participation in the study. The sample size within in this study was relatively small as a result of the age of participants. Due to their age it was deemed unethical to obtain a larger sample than 70 participants. Also as a result of consent forms being required, a vast majority failed to return them therefore they were exempt from the study.

### **Design**

This study was of a cross-sectional, between groups design. All data was collected at the same time on the same day in all three environments. This study also comprised of a mixed methods design. It is considered a mixed methods design as it used both quantitative and qualitative research. The quantitative research consisted of the data collected from the use of questionnaires, trials and environmental equipment to measure environmental temperature and noise and the children's attitudes, perception and performance. Qualitative research was used to gain insight into teacher's attitudes of teaching in the temporary learning environment. The study was also of an opportunistic design as all participants were acquired from the same area and from the same school.

The first hypothesis consisted of one independent variable and one dependent variable. The independent variable was each of the environments and the dependent variable was task performance. The other hypotheses aimed at discovering a relationship with task performance, therefore correlation was employed.

### **Measures**

Within the study, a number of materials were required to obtain a measurement of task performance, attitudes, perception and environmental factors such as; noise (Decibels) and temperature (Celsius).

### **Task Performance**

In order to measure the student's task performance the trail making test (Lezak, Howieson & Loring, 2004) was administered. The trail making test is a test which consisted of two trails, trial A and trial B. Within each trial the participants were assessed on their ability to correctly connect all the numbers together in trial A and correctly connect the numbers to letters in serial order in trial B within the 5 minute time space of each trial. The traditional use of this test is to measure an individual's cognitive ability. However, in this study the use of the trail making was used as a universal level of measurement of task performance.

### **Perception of environment**

The student's perception of the effect of the environmental factors on their learning abilities was measured with the use of The Built Environment Questionnaire (Marchand et al., 2014). With a cronbach's alpha of .95. This is a 12 item scale, which is used to assess the individual's perception to their current learning environment. Questions

within this scale address the learning environment with regards to glare, stuffiness and noise. In this questionnaire participants are required to rate their agreement on a scale of 1 – 5, 1 being completely disagree and 5 being completely agree.

### **Attitudes towards environment**

In order to measure the student's attitudes towards their environment a 5 item scale was used. This scale required students to rate their agreement on a scale of 1-5 on a likert scale, 1 being completely disagree and 5 being completely agree. Questions in which students were required to rate their agreement consisted of one's comfort level and positivity towards their environment. This scale however, was created by the researcher as there was no freely available scale to assess children's attitudes towards their learning environment. A reliability cronbach's alpha was conducted on the attitudes scale and it received (.91).

The teacher's attitudes and perceptions to teaching within a prefab were measured as they were given a box to provide their personal experience of teaching within the environment.

### **Environmental Factors (Noise and Temperature)**

Environmental factors such as noise and room temperature were measured using official equipment. Noise was measured using an official decibel reader. Temperature was measured in degrees Celsius using an official non-contact infrared gun digital thermometer.

### **Procedure**

#### **Ethical Considerations;**



Prior to any research being conducted it was essential to obtain consent forms from parents and guardians as a result of the children being under the age of 18. Consent forms were provided to each of the student and were signed and returned to the school. In the consent forms parents and guardians were informed about the nature of the test and the confidentiality of results. They were also supplied with a direct email address and phone number to the researcher should they have had any queries. They were also informed that their child did not have to take part in the study. Due to the fact the children were under the age of 18 it was recommended by the ethics committee to have a smaller sample therefore, the sample size was reduced. Additionally, the researcher intentionally did not administer the tests as they did not want the children to feel pressured into giving different answers.

*Administering the test:*

Prior to any student entering the rooms the researcher took a recording of the temperature and noise level in each of the three rooms. Teachers of the 3 class groups tested (the old prefab, the new prefab and the classroom) were each given a folder with all of the tests in them including a set of instructions of how to administer the tests. The instructions gave a step by step guide to aid teachers to successfully administer the test. The instructions stated that students must complete the trail making test first to measure their level of performance within the class. Teachers were instructed to set a timer of 5 minutes on the interactive board for trial A and each child was informed to record their completion time for Task A. After completing Task A students were required to complete Task B. Teachers reset the timer back to 5 minutes and upon completion students recorded their time.

Following the administration and completion of the trail making test children were required to complete the Built Environment Experience Scale. Within this test the students rated their agreement on a scale of 1-5, with one being completely disagree and 5 being completely agree in terms of their perceptions to the impact that environmental factors within the room pose on their learning. Finally, students were required to answer a questionnaire consisting of 5 questions in relation to their attitudes towards their current learning environment. This questionnaire comprised of students rating their agreement on a scale of 1-5 regarding their attitudes of the environment they are taught in. The last question on the test also requires the students to circle their preferred learning environment, either a prefab or a classroom. Teachers were also given a sheet to state their personal opinion and experience of teaching in a prefab as opposed to a classroom.

### **Data Analysis**

The data analyses that were employed in this study consisted of descriptive and inferential statistics. Descriptive statistics were administered to measure the mean, median, standard deviation and range of participant's results in relation to task performance, attitudes, perceptions, temperature and decibels. After descriptive statistics were conducted inferential statistics were used to make sense of the descriptive and further explain the findings. The inferential statistics that were used were One-way Analysis of Variance (ANOVA) and Pearsons Product moment correlation. ANOVA was administered in order to determine if there was a difference in task performance between the three environments. As a result of small sample size multiple regression could not be used to determine if there was a direct impact of one learning environment on task performance rather than a difference in task performance amongst all three.

Correlation was used in order to determine the relationship between the child's perception of their environment and their task performance. Correlation was also used to determine the relationship between the child's attitudes towards their current learning environment and task performance.

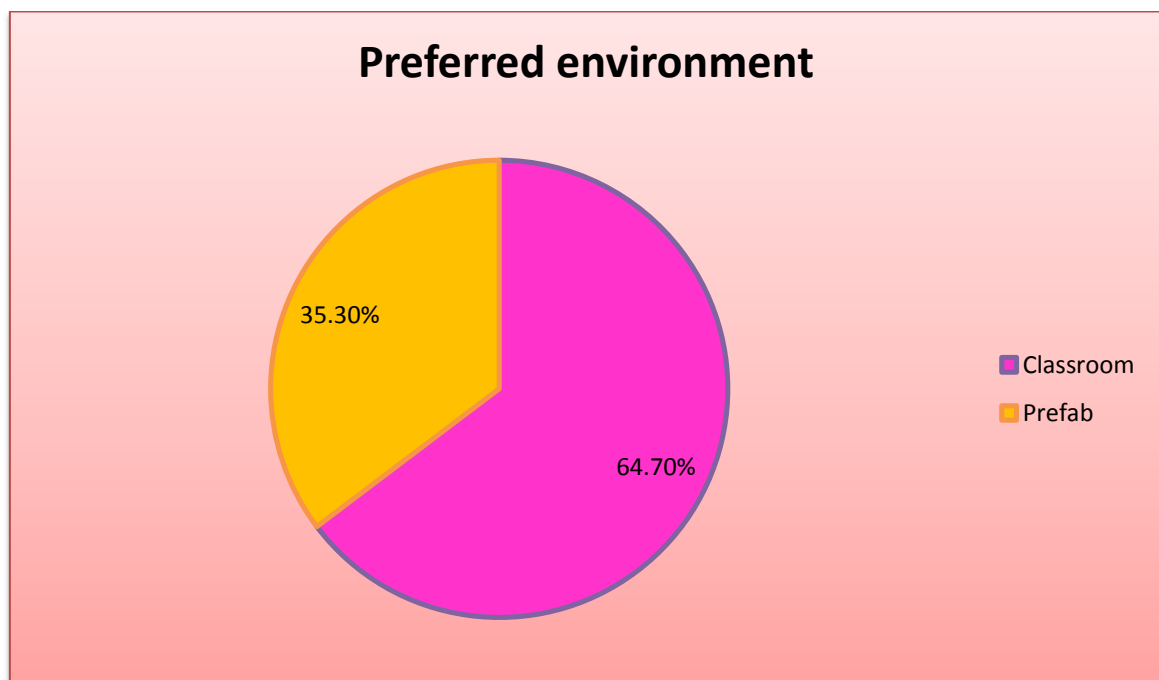
## Results

**Frequencies for the current sample of second year students taught in either a prefab or a classroom learning environment (N = 51) (Fig 1.1)**

Variable	Frequency	Valid Percentage
<b>Gender</b>		
Male	24	47.1
Female	27	52.9
<b>Environment</b>		
Old Prefab	19	37.3
Classroom	16	31.4
New Prefab	16	31.4
<b>Preferred environment</b>		
Classroom	33	64.7
Prefab	18	35.3
<b>Temperature</b>		
(Celsius)	19.7	37.3
Old Prefab	19.1	31.4
Classroom	10.6	31.4
New Prefab		
<b>Noise (Decibel)</b>		
Old Prefab	54.4	37.3
Classroom	45.6	31.4
New Prefab	39.6	31.4

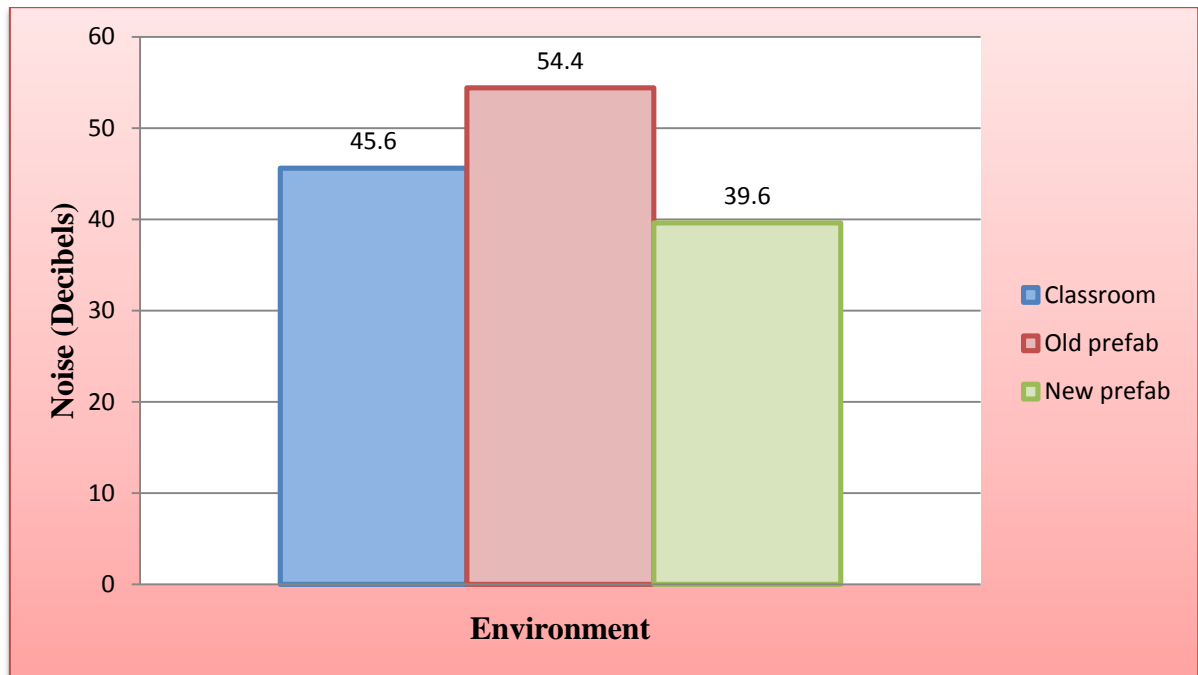
Descriptive statistics in the table above clearly indicate that there are 24 males and 27 females (N=51). Within the study there are three learning environments, Old prefab (N=19), Classroom (N=16), New prefab (N=16). Results also indicate that the preferred environment for students is the classroom (N=33; 64.7%) as opposed to the prefab (N=18; 35.3%). Additionally, results indicate that with regards to temperature and noise both vary depending on learning environment. Results show that the hottest learning environment is the old prefab and the coolest is the new prefab. Likewise, the learning environment with the most noise is the old prefab and the environment with the least noise is the new prefab.

**Fig 1.2**



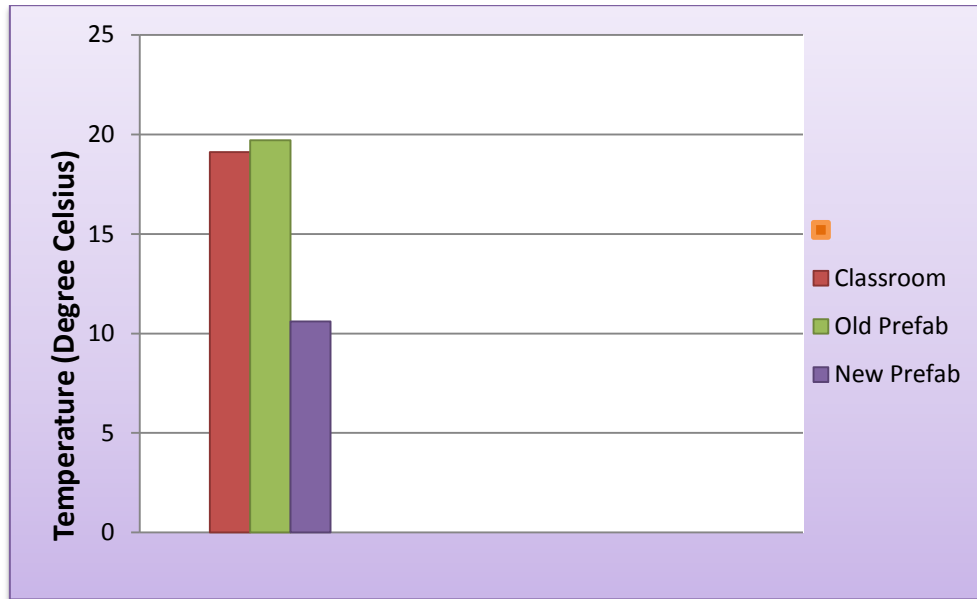
As previously mentioned above the preferred environment for student is the classroom (33) as opposed to the prefab (18). The pie chart clearly represents that 64.7% of students within this study would prefer to be taught in a classroom as opposed to a prefab where a mere 35.3% said they would prefer to be taught in a prefab.

**Fig 1.3**



In the bar chart above it is clearly represented that noise is different within each learning environment. Results for noise measured in decibels clearly indicate that the learning environment with the most noise is the old prefab which has a decibel noise of 54.4. The environment with the second most amount of noise is the classroom at 45.6. Finally the environment with the least noise is the new prefab with a decibel level of 39.6.

**Fig 1.4**



The bar chart above clearly represents that the temperature measured in degrees Celsius is different for each environment. The descriptive results clearly indicate that the room with the highest temperature is the old prefab which is marked at 19.7 degrees Celsius. The classroom is the second hottest environment which is 19.1 degrees Celsius and finally the learning environment with the lowest temperature is the new prefab which was a temperature of 10.6 degrees Celsius.

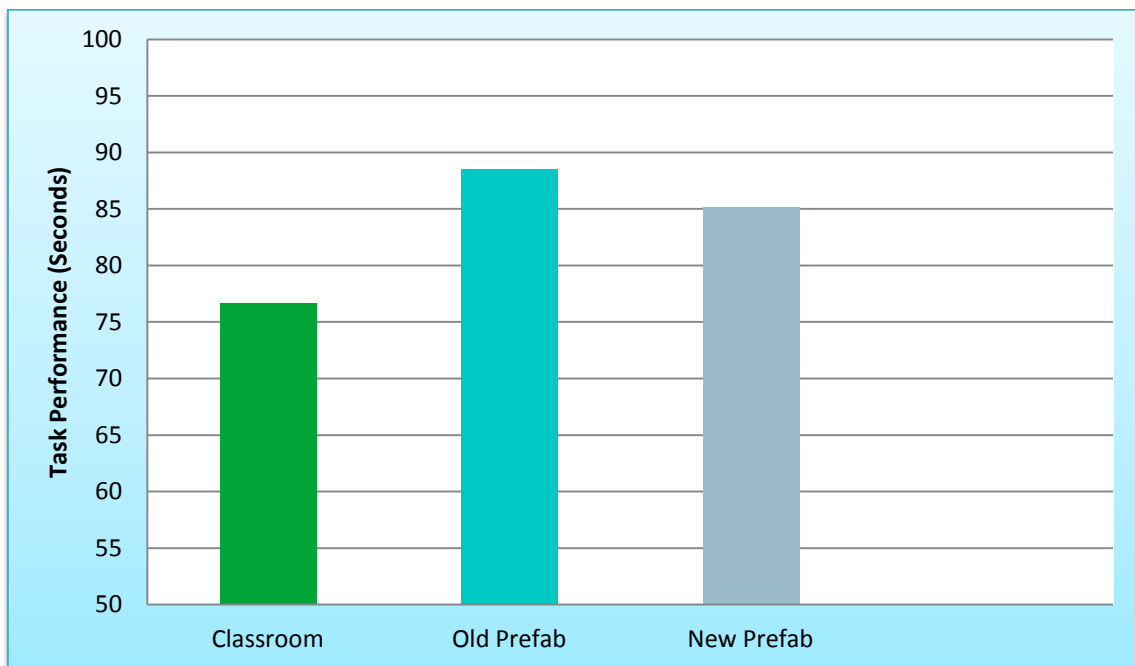
***Descriptive statistics of all continuous variables (Fig 1.6)***

	Mean (95% Confidence Intervals)	Std. Error Mean	Median	SD	Range
Overall TP	83.75 (76.08-94.41)	3.82	77.0	27.26	36-150
Classroom TP	76.69 (66.80-86.57)	4.63	75.5	18.55	46-110
Old prefab TP	88.47 (75.32-101.62)	6.26	83.0	27.29	51-147

New prefabTP	85.19 (67.08-103.30)	8.50	77.0	34.0	36-150
Perception	31.92 (28.64-35.21)	1.63	30.0	11.68	16-60
Attitude	13.08 (11.57-14.60)	.75	12.0	5.36	5-25

**Performance (TP)**

Results indicate that with regards to overall performance for all learning environments the mean is moderate to high. It is reasonable to state this as the range values from 36-150 and the average score of 83.75 is just slightly over the middle value. It is also reasonable to state that performance is near enough normally distributed as both the mean and median are close in values. Additionally with regards to performance in each learning environment it is evident that the classroom has the quickest performance and the old prefab has the slowest. Therefore the students in the classroom performed better on the test than the children in both of the prefabs.





## Perception

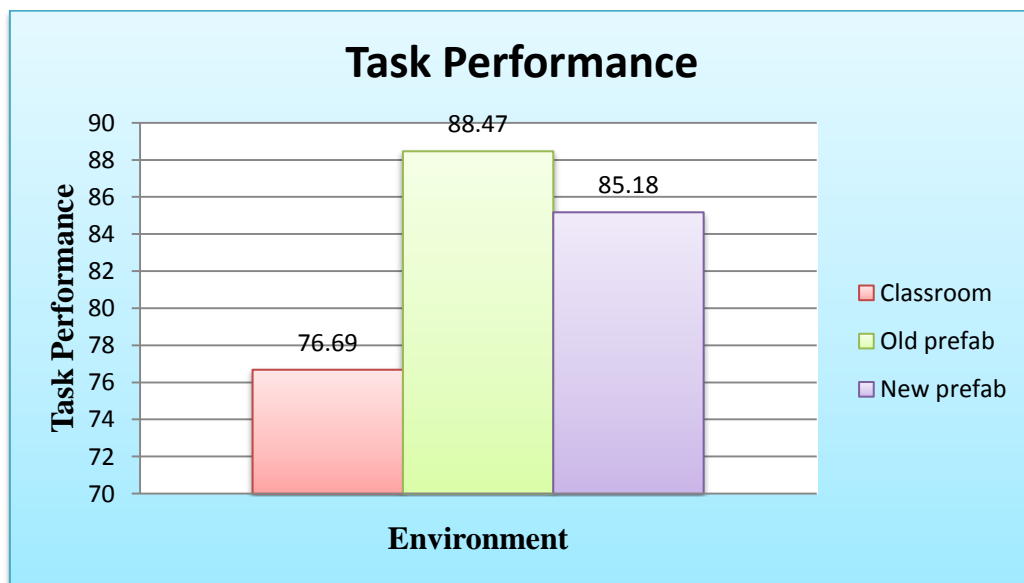
Results for student's perception for all learning environments clearly indicate that it too is relatively normally distributed as the mean value is 31.92 and the median value is 30.0. This indicated normal distribution as the values are close together. With regards to the mean it can be stated that the mean is of moderate to high standards. This can be seen as the range values from 16-60 and the mean score is just above the middle marker.

## Attitude

The results presented in the table above regarding student's attitudes regarding all learning environments clearly indicate that it is normally distributed as the median and mean are close together in terms of values. Regarding the mean it is evident that the mean is of moderate standard. The mean value is 13.08 with the range from 13 to 25 therefore it is reasonable to suggest that the mean is of moderate standards.

## Hypothesis 1

Fig 1.7



A one-way between groups analysis of variance was conducted to explore the impact of learning environment on task performance. Participants were divided into three groups according to their learning environment (old prefab, N = 19; classroom, N = 16; and new prefab, N = 16). There was not a statistically significant difference in level of task performance scores for three environment groups  $F(2, 48) = .84, p = .44$ . The effect size, calculated using eta squared, was .03. Post-hoc comparisons using the Tukey HSD test indicated that the mean score for task performance in the classroom ( $M = 76.69, SD = 18.55$ ) was not significantly lower ( $p = .42$ ) than task performance in the old prefab ( $M = 88.47, SD = 27.30$ ); and not significantly higher ( $p = .66$ ) than task performance in the new prefab ( $M = 85.18, SD = 33.98$ ). There was no statistically significant difference in mean scores between task performance in the old prefab and the new prefab.

## **Hypothesis 2**

**Fig 1.8**

	Mean Task performance (Seconds)	Temperature (Degrees Celsius)	Noise (Decibel)
Classroom	76.70	19.1	46.6
Old Prefab	88.47	19.7	54.4
New prefab	85.19	10.6	39.6

The table above clearly represents the mean of each learning environment in terms of task performance, temperature and noise level. It is evident that the classroom has the quickest speed in task performance and the old prefab has the slowest performance. Results also indicate that both prefabs have extremely different temperatures. Similarly the same can be said for the level of noise.

### **Hypothesis 3**

*Correlations between all continuous variables (Fig 2.0)*

<b>Variables</b>	1	2
1. Task Performance	1	
2. Attitude	-.03	1

Note. Statistical significance: \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$

In the table above the relationship between attitudes of the environment and task performance was investigated using Pearson product-moment correlation coefficient. Preliminary analyses were performed to ensure no violation of the assumptions of normality, linearity and homoscedasticity. There was no correlation between the two variables,  $r = -.03$ ,  $n = 51$ ,  $p = .84$ . Additionally, the finding was non significant.

#### **Hypothesis 4**

**Fig 2.1**

<b>Variables</b>	1	2
1. Attitudes	1	
2. Perception	-.52	1

Note. Statistical significance: \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$

In the table above the relationship between perceptions of the environment and attitudes were investigated using Pearson product-moment correlation coefficient. Preliminary analyses were performed to ensure no violation of the assumptions of normality, linearity and homoscedasticity. There was a negative, moderate to high, correlation between the two variables,  $r = -.53$ ,  $n = 51$ ,  $p = < .05$ .

**Fig 2.2**

<b>Variables</b>	1	2
1. Task Performance	1	
2. Perception	.13	1

Note. Statistical significance: \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$

In the table above the relationship between perceptions of the environment and task performance was investigated using Pearson product-moment correlation coefficient. Preliminary analyses were performed to ensure no violation of the assumptions of

normality, linearity and homoscedasticity. There was a weak, correlation between the two variables,  $r = .13$ ,  $n = 51$ ,  $p = .37$ . However, the finding was not significant.

### **Aim 1**

Teacher's attitudes towards their experience of teaching were recorded by teachers in a once-off diary. 3 main themes arose when the teachers reported their experiences. The first theme that occurred was lack of environmental control. All three teachers stated "It is quite uncomfortable due to lack of temperature control; it is either too stuffy or too cold". The second theme that is present is the remoteness of the prefab. All 3 teachers state that it is "a remote learning environment as it is outside the school building, away from the staff room". Finally, the third theme that is present is concerning the safety of the environment. The teachers state that the "windows do not open properly as they have cages on them" also they state that "there is no fire exit in the room".

## *Discussion*

Within this study there were four main hypotheses and two aims set out. The primary objectives within this study were to determine if task performance differs between the three environments, to determine if attitudes and perception have a relationship with task performance and to discover if temperature and noise differ in the three environments and if this difference has a relationship with task performance.

### **Hypothesis 1**

Hypothesis one stated that there will be a difference in task performance depending on the environment in which the child currently learns. Specifically, the children taught in the prefab environment will have lower levels of task performance than the classroom. However, hypothesis one was not supported by inferential statistics. Descriptive statistics clearly indicated that there was a difference in task performance between the three learning environments with the classroom having the quickest task performance. However upon further investigation, a one-way between groups analysis of variance clearly indicated that this difference was non-significant difference. This non-significant result in difference of performance may be due to the small sample size, thus a type 2 error has potentially occurred.

This hypothesis was of exploratory nature as a study of its kind has not been conducted; however, previous research indicated that the environment in which a child learns can have an impact on their performance (Kobayashi, Ohashi, and Ando, 2002). Specifically Kobayashi, Ohashi and Ando discovered that there would be better performance on a task if it was conducted in an enriched environment rather than an environment that is not considered to be enriched. In spite of this, it must be noted that evidence has not yet

shown a prefab to be considered a non-enriching environment as majority of learning environments are considered enriched with the use of posters and interactive white boards (Tanner, 2000) therefore, alternative research set out to determine the impact of architecture on task performance as the architecture of the prefab is considerably different to the traditional classroom.

Research conducted by Strichez (2000) set out to determine the impact of the school architecture on a child's task performance. Upon analysis it was discovered that children taught in the old shabby buildings performed worse on the task as opposed to the children that were taught in the new building. Thus, task performance was lower in the old building as opposed to the newer building. However, it must be noted that this study was a between groups design therefore the difference that is found may be due to individual, intellectual differences rather than the environment posing as the cause for the difference in task performance. Additionally research conducted by O'Neil and Oates (2001) contradicts the findings of this study.

O'Neil and Oates also set out to discover the impact of architecture on task performance however, within their study they considered to opinions of the parents. Upon investigation they noticed that parents found their children to be more productive and to have greater attendance if they were taught in a newer building as opposed to an older building. Although this research shows to contradict the findings of this study it must be noted that there are a considerable amount of limitations regarding the study conducted by O'Neil and Oates which may be the cause of the difference in results. One limitation that is present is that the measure used is a self report scale therefore the responses may be unreliable. Secondly the responses are based upon the opinions of the parents rather

than the students or teachers. This is a limitation as the parents are not in the classroom to determine the level of productivity their child has.

Due to previous research showing the impact of the architecture of the buildings on task performance it was necessary to determine if the same result was found for the temporary accommodations as they were promoted as a 'temporary' fix however, there are over 1000 of them still widely used to date. Therefore it was deemed essential to conduct a research study of this kind. It is evident that task performance is different between the three environments, however, it is non-significant. This difference in results may be due to the fact that the sample size is too small thus there is not enough power to reach the necessary significant result.

## **Aim 2**

An aim that was presented within this study stated that temperature and noise would differ in each of the environment. This aim was discovered to be true as basic descriptive results clearly indicated that the temperatures in each environment varied with the old prefab being the hottest (19.7 degrees Celsius) and the new prefab being the coldest (10.6 degrees Celsius) and the classroom scoring in the middle (19.1 degrees Celsius). Likewise, results indicated that noise levels in each environment varied with the old prefab being the loudest environment (54.4 decibels) and the new prefab being the quietest environment (39.6 decibels) and the classroom scoring in the middle also (46.6 decibels). These results clearly show that in the measure of both environmental factors the prefab; both old and new are the extremities of results. Thus, there is a lack of control of environment factors. With regards to previous research it is evident that the room with the lowest temperature is the room with the lowest task performance. These



descriptive results coincide with the research by Nadler and Busch (2002) as they state that the least productive temperature is 10 degrees. However, it cannot be stated that this low temperature was the result of the low performance in the task rather it is just an observation of descriptive results.

## **Hypothesis 2**

However, with respect to noise and temperature having a relationship with task performance this could not be supported as due to limitations in the collection of data statistical analysis could not be conducted. However, in Fig 1.8 it clearly indicates that task performance varies between environments with the classroom having the best performance and the most controlled temperature and noise levels; therefore in future research if data is collected in a more appropriate form statistical analysis may be conducted in order to determine if temperature and noise have a relationship with performance. Therefore future research may be able to determine the strength of the relationship between temperature, noise and task performance, thus potentially supporting previous research and bringing rise to future implications.

Regarding previous research, it has stated that excessive noise poses as a stressor and distraction on a child thus, reducing their task performance (Evans & Kantrowitz, 2002). Hygge, Ljung and Sorqvist (2009) conducted research to assess the impact of external noise on task performance. Within their study they discovered the greater the levels of external noise the lower the levels of attention, thus, task performance is reduced, therefore, this may be the underlying reason for the low task performance in the prefab. Regarding temperature, previous research has shown that the optimal temperature for a classroom is 20-24 degrees Celsius (Earthman, 2002) and the least

productive temperature is 10 degrees Celsius (Nadler and Busch, 2002). Previous research has also shown that extreme temperature negatively impact performance (Nadler and Busch, 2002). Therefore, this may also be the underlying reason task performance in the prefab being lower than that of the classroom. However in contrast, alternative research has shown otherwise in terms of the impact of temperature on task performance. Amos and colleagues (2000) found that extremities of temperature did not have a negative relationship on one's task performance. Within their study they monitored soldiers who were serving in terrains of extreme temperatures. Their results discovered that the excessive temperatures in which the soldiers were serving in did not have a negative impact on their task performance.

However, it must also be noted that the potential reason as to why the results of the research conducted by Amos and colleagues differs to alternative previous research may be as a result of the participants within this study consisting solely of soldiers rather than students. Therefore the difference in results may be due to the extensive training the soldiers receive in order to withstand the harsh conditions they may face. As a result, they may be taught to attain a stronger positive attitude towards the environment in which they must serve, whereas children do not receive this training. In light of this research and the limited knowledge that the descriptive statistics supply a difference may potentially be discovered if statistical analyses can be conducted.

### **Hypothesis 3**

Hypothesis three states that the attitudes the child holds of their current learning environment will have a relationship with their task performance. Likewise, hypothesis three was not supported. However, upon investigation of the descriptive statistics it is

extremely evident that the preferred learning environment for the students is the classroom (64.7%) as opposed to the prefab (35.3%). Previous research has shown both an agreement and contradiction to the findings of this study. Therefore, similarly to hypothesis two it may be as a result of small sample size. Afari and colleagues (2013) conducted a study which results contradict the findings of this study. Within their analysis they assessed the impact of the student's attitudes on their mathematical achievement. Their results indicated that the students who possessed a positive attitude had greater educational achievement. Although it must be noted that the sample size within that study is of a small size therefore it does not sufficiently represent an entire population of student. Additionally, due to the low sample size it may potentially skew results thus this may be the reasoning for finding a relationship.

However, in contradiction to this and in support of the findings of this current study, Hilal (2000) conducted a study to determine the impact of attitudes on task performance. Within the study it was found that although attitudes did have an impact on task performance it was an indirect effect with level of aspiration posing more of a direct effect on task performance. Therefore, it is reasonable to suggest with reference to previous research that although within this study it is shown that attitudes towards the learning environment do not have a relationship with task performance, this may be the result solely as an additional unknown variable may hold a stronger effect on task performance.

Amos and colleagues (2000) also conducted a study in support of attitudes having an impact on performance. Within their study they monitored soldiers who were serving in extreme terrain conditions. Results concluded that the soldiers who had positive attitudes did not show a reduction in performance as opposed to the soldiers who had a

negative attitude. Thus their research indicated that the impact of extreme temperatures can be overcome with a positive attitude. However, results in this study may be different to the results of the study of Amos and colleagues due to the fact that the soldiers are trained to withstand these environments and have a positive attitude whereas the students are not. It must also be noted that albeit Afari and colleagues discovered an effect their sample consisted solely on freshman students which are younger than the sample in this study therefore attitudes may not hold an effect over all age groups.

### **Aim 1**

Aim 1 was investigated within this study. The aim that was proposed was to explore the attitudes held by teachers who were teaching within the prefabricated (alternative) learning environment. Due to qualitative analysis, information was successfully gathered regarding the attitudes teachers held of teaching in a prefabricated environment. Upon investigation, 3 main negative themes were present concerning temperature control, remoteness and safety. Goodman (2016) discovered that the attitudes in which a teacher possesses has an impact on a child's task performance. Therefore it is reasonable to suggest that if the teacher holds a negative opinion of the learning environment it may have a negative impact on the student's task performance. Therefore as this was not measured in terms of quantitative analysis it may be the underlying factor as to why a significant result was not discovered in relation to attitudes and task performance.

In light of the descriptive results and qualitative result it is extremely evident that both teachers and students have a negative attitude towards the prefabricated environment and they would prefer to be taught/teaching in a classroom environment. Therefore it is reasonable to suggest that although a statistically significant result was not found there

may be another underlying variable that impacts their attitudes thus potentially having an impact on task performance. A relationship may not have been discovered to low sample size and an additional underlying variable that has more of a direct effect on task performance than attitudes, therefore a multiple regression may bring more information to light.

#### **Hypothesis 4**

Hypothesis four stated that the child's perception and attitudes towards the environment will have a relationship and these perceptions of the environment will have a relationship with task performance. Specifically, a child with a negative perception of their environment will have reduced task performance. This hypothesis however was only half supported. It was shown that attitudes and perceptions did have a relationship however perception and task performance was not supported. Hypothesis four has a link with both attitudes and environmental factors. In order to measure the child's perception of the environment the child was asked questions regarding the impact they felt that environmental factors had on their performance. Previous research which supports the relationship between perception and task performance relates to attitudes previously mentioned above. Amos and colleagues (2000) supported the idea that attitudes and perceptions have an impact on task performance. They found that soldiers who had both positive attitudes and perceptions would not experience a reduce in their performance when serving in terrains of excessive heat. However, as previously stated it must be noted that the sample consisted of soldiers who are trained to have positive outlooks therefore this is why they could control their performance. However, the children do not have this training therefore this may be the reason why there is a difference in results.

The difference in results from previous research to this study may be due to the fact that within this study the sample size is very small. Therefore due to the small sample size of 51 participants a type two error may be occurring. A type two error occurs as a result of insufficient power within the analysis thus, failure to detect a significant difference when one is present. Albeit not a hypothesis, the teacher's attitudes towards teaching in a prefab were asked. All three teachers stated that the prefab was not as pleasant as the classroom to teach for multiple reasons such as lack of temperature control and external noise is clearly heard which poses as a distraction in their opinion. Also they think of it as a hazard as there is no fire exit and there are cages over the windows. However, this was not assessed statistically therefore it cannot be assessed in terms of its impact on children's performance in which previous research has shown that the attitudes that teachers hold have an impact on students (Goodman, 2016).

### **Strengths**

Although all results failed to reach statistical significance, this study had a number of benefits in relation to the field of education. One benefit that is evident within conducting this study is that it is one of the first studies of its kind to assess the temporary accommodation in terms of task performance. This is a benefit as it can be clearly seen that an excessive amount of resources are being spent on renting these environments and it is not yet understood if they have an impact whether positive or negative on the child's performance or potentially their health.

Another benefit of conducting this study is that it is evident that the majority of children that took part in this study would prefer to be taught in a prefab rather than a classroom; likewise the teachers state similar results. Both groups have stated that it is

not possible to control the temperature within the prefab. Additionally results support the attitudes of the teachers and students with regards to lack of temperature control as the prefabs score both the highest and lowest temperature. Therefore this research is considered beneficial as majority of both students and teacher are non favourable towards the prefab learning environment as opposed to the classroom environment. Therefore there is potentially an underlying reason as to why these negative attitudes exist, thus further research may discover this.

### **Limitations**

This study consisted of multiple limitations which could be applied to the reason for the main hypothesis being a non-significant result. The first major limitation that exists is the sample size. The sample size consists of 51 participants which is a considerably small sample size to represent an entire schooling population. This is considered a limitation as previously mentioned due to the lack of power a type two error may occur. A type two error can be defined as the inability to detect an effect even if one is present due to the lack of power of a low sample size. Therefore as seen in the descriptive statistics that task performance is different between the three environments, however due to sample size there may not have been enough power to report these differences as significant.

Additionally, the method of data collection for temperature and noise was a limitation. It was considered a limitation as only one temperature and one noise level was taken for each learning environment. Therefore hypothesis two could not be statistically analysed with task performance as the individual student's temperature may have differed thus it could not be controlled for.

Also another limitation that is present within this study is as a result of the statistical analysis that is employed to measure the effect of attitudes, temperature, noise and perception on task performance. Within this study all hypotheses apart from hypothesis one were assessed using correlation. Therefore this statistical analysis solely assesses the relationship between the variables and task performance rather than the causation these variable may have on task performance. The reason as to why correlation was conducted was as a result of the small sample size as multiple regression analysis could not be used as a sample of 80 participants or more would be required due to the basic assumptions of multiple regression analysis (Stevens, 1996). Therefore, if a bigger sample was obtained multiple regression could be conducted to determine if attitudes, noise, temperature and perception have an impact on task performance. This would be a far more beneficial form of analysis to use as additional variables can be controlled for. Therefore a direct impact can be discovered unlike the use of correlation which does not indicate all the underlying relationships which may be the cause of a non significant result as there may be a more direct unknown relationship present.

Additionally in relation to the sample, it consisted solely of second year students in the same school. This is a limitation due to the fact that it cannot be considered a representative sample as it does not assess different years or different schools. Therefore it would be beneficial to obtain more of a representative sample in the future.

Another limitation within this study is the use of self reports to measure the student's perception and attitudes of their current environment. Albeit, self reports are widely used in a number of fields of psychology they must be administered with a great deal of caution due to the fact that students may be dishonest in their results, the questions may be presented in a way that may be too difficult for some students to understand what is



being asked of them and finally self reports come with a lack of insight into further cognitions.

Finally, this current study is a between groups study. Therefore the children are compared on task performance with other children their age in different learning environments. This is considered a limitation as some individuals may perform faster on the task due to individual reasons not due to the environment in which they are currently in. The design that is used in the study was of cross-sectional nature due to time constraints. This is a limitation in itself as it only gives a representation of results over a short period of time. Therefore an effect may be found after an increased amount of time being tested.

### **Future recommendations**

Upon replication of this study it is necessary to note additional changes in order to potentially discover a result. The initial change is to obtain a far larger sample size of students of different ages, in different year groups and in multiple schools potentially schools in different demographic areas. This is necessary as it would be a far more representative sample of the entire schooling population and the test would have far greater power, thus there is less of a chance of a type two error occurring and a greater chance of discovering a statistically significant result. Also, measure the temperature of each of the students taking the test in order for temperature and task performance to be statistically analysed.

Additionally, it would be in the researcher's best interest to conduct a longitudinal, within groups study to discover the impact of prefabs on an individual's overall performance over time to determine if there will be an impact of the learning

environment on task performance and to control for individual differences that occur in between groups analysis. Furthermore, teacher's attitudes towards the environment should also be collected and assessed as quantitative data in relation to its impact on student's attitudes and task performance as previous research states that teacher's attitudes have an impact on student's attitudes and overall performance.

### **Implications**

Although results discovered were non-significant, the research that was conducted can be considered beneficial for future implications in the areas of research, policy and education. This study brings rise to further research implications as future researchers can conduct studies in order to determine the impact of teacher's attitudes on student's attitudes in terms of learning environment. These research implications will also bring rise to both policy and educational implications as it has been discovered that both teachers and students have negative attitudes towards prefabs as opposed to classrooms. Therefore with further research it can be assessed to if these attitudes have an impact on the performance of the children thus, if a result is found it will benefit future educational requirements, potentially saving the Government money on the rental of the prefabs. Additionally, it has been shown that task performance is different in the three environments, albeit non-significant. This could therefore bring rise to future research as if alternative measures could be used to discover if this difference could be found as significant if changes are made to the methodology.

In conclusion, it can clearly be seen through previous research that the environment in which a child learns is vital for successful performance. Previous research also clearly indicates that temperature, noise and attitudes have an impact on performance.

However, with regards to this current study all hypotheses failed to make significant results. Descriptive statistics however did indicate a difference in temperature, noise and task performance amongst the three environments although it is non-significant. This may be due to the fact that the sample size is extremely small with only 51 participants. Therefore a type two error may occur as there is no power in the test. Also results may not reach the statistical significance as only analysis measuring relationships was employed. Therefore these variables could potentially have an impact on task performance but there may be another unknown variable which has a stronger relationship. Finally, future recommendations should be considered upon replication of this study. Firstly, sample size should be increased in order to be able to use statistical analyses that investigate causation also to ensure that there is enough power and a type 2 error does not occur. Secondly, this study should be conducted as a longitudinal approach with different class groups and schools in order to discover the true effect of environment, noise, temperature, attitudes and perception on task performance. Thirdly, teacher's attitudes should be measured as quantitative data rather than qualitative data in order to investigate the impact of this on task performance and children's attitudes. Finally, temperature and noise should be collected in a different manner in order to analyse results statistically. Therefore, it should be investigated if collecting the temperature of each participant is possible.

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Appendix 1

**Coláiste Phobail Leamhcáin**  
**Lucan Community College**



Céide na hEascaí, Leamhcán, Co. Átha Cliath  
Esker Drive, Lucan, Co. Dublin  
Guthán / Telephone: 01 6282077  
Facs / Fax: 01 6282117  
Idirlíon / Internet: [www.lucancc.ie](http://www.lucancc.ie)  
R-Phost / E-mail: [admin.lucancc@ddletb.ie](mailto:admin.lucancc@ddletb.ie)

Príomhoide /Principal: Diane Birnie  
Príomhoide Tánaisteach / Deputy Principal: Andrew Purcell

Letter of Consent for research into Temporary Accommodations  
in Lucan Community College

Dear Sonja,

We would be delighted to accommodate you in your research project this December.

If you can arrange it, can you conduct your research within Lucan Community College on the 13th of December (Tuesday) as previously agreed?

I will bring you into the three different Temporary accommodation buildings (H, L and M areas) so that you can check your temperature, noise etc. levels and complete the survey with the nominated students in these classes.

We will have all the permission slips signed for you on your return date.

If there is any change in your plans please let me know.

Thanking you,

*Andrew Purcell*

Deputy Principal

## Appendix 2

### **Information sheet and Consent form for Study with Under 18s (Secondary School)**

INFORMATION SHEET FOR PARENTS Research Topic: To investigate the difference in attitudes, perceptions and task performance in temporary accommodations and classrooms.

**Researcher:** Sonja Collins, Student researcher, 0870628389

Dr. Kent.

**Background and Purpose:** In my research I am interested in finding out if task performance and attitude will differ within prefabs as opposed to classrooms. I am interested in giving each child a test provided by their teacher to measure their task performance. They will receive a questionnaire to measure their attitude and their thoughts of the environment also. I am doing this as part of my studies at The National College of Ireland, and I am working under the supervision of Dr Kent.

**What happens if my child takes part?** I will be visiting your child's school during class time, at a time arranged with the principal. I will ask the teachers to hand out the trail making test which is a joining dots test to measure task performance. This test will be administered by their teacher. Questionnaires regarding environment and their attitudes will also be administered by the teachers. The whole test itself should take no more than 15 minutes to complete. If you decide your child will not take part your child will be present in the classroom but will not do the test or fill in the questionnaires. They will be asked to complete the work set up for them by the teachers while the others take part.

**What will happen to the results of the study?** The information from the children's test scores and questionnaire responses will tell us about if the architecture of the learning environment

will affect one's performance and attitude. The study's results will be published on the database in The National College of Ireland. However, at no point will any children be identifiable and results will not be posted individually only as an overall result.

**How will my child's information be protected?** The children's answers will remain confidential. When doing the test and questionnaires, each child will be given an ID number. This will be used for any information relating to the study. The information will be stored in a secure location in The National College of Ireland until the research is completed. Once the study has been completed all the data will be destroyed after 5 years. Voluntary Participation: It is up to you and your child to decide whether your child is going to take part or not. Participation is completely voluntary. Your child is free to withdraw at any time. The teacher will remind them of this before they start.

**Important:** The consent form! There is a consent form attached to this information sheet. Every child participating on the day must have a consent form which you have signed. Please note that research practice guidelines do not allow me to make any exceptions, and verbal permission cannot replace the signed consent form. It is important to remember to return the signed form to school as without it your child will not be allowed to take part. Further Information: This research is being conducted to assist researchers with finding out about if prefabs have an effect on one's task performance and attitude towards their learning environment. We very much hope that you will agree to let your child take part in the research. If you require any assistance or have any questions about the research study, please feel free to contact me. Thank you very much for supporting this research study. Please keep this information for your records.

PARENT'S CONSENT FORM

**Title of Study:** The influence of learning environment, attitudes, perceptions and environmental factors on task performance:

**Researcher:** Sonja Collins, Student researcher, 0870628389 Dr, Grainne Kent

Parents Name: \_\_\_\_\_

Child's Name: \_\_\_\_\_

I confirm that I have read and understood the Information Leaflet for Parents for the above research study and have received an explanation of the nature, purpose and duration of the study. I understand what my child's involvement will be. I have had time to consider whether I want my child to take part in this study. Any questions have been answered satisfactorily. I have explained this study to my child and I am happy that he/she understands what is involved. I understand that my child's participation is voluntary (that my child and I have a choice as to whether she/he participates) and that my child is free to withdraw at any time if she/he chooses to do so. I understand that the information collected may be presented and/or published in academic journals and at conferences, but that no child will be identifiable from the information. I agree for my child to take part in the above study.

..... Name of Parent (in block letters)

Date .....

Signature .....

*Appendix 3*

*Built Environment Experience Survey (Measure of Perception)*

**1. The room moisture (stuffiness/Sweatiness) negatively affects my performance on the reading and test assignments (classwork/exams).**

Strongly agree Strongly disagree

1                      2                      3                      4                      5

**2. I have difficulty focusing my attention on the reading and test assignments (classwork/exams) because of the room moisture (stuffiness/Sweatiness).**

Strongly agree Strongly disagree

1                      2                      3                      4                      5

**3. The room temperature negatively affects my performance on the reading and test assignments (classwork/exams).**

Strongly agree Strongly disagree

1                      2                      3                      4                      5

**4. I have a difficulty focusing my attention on reading and test assignments (classwork/exams) because of the moisture (Stuffiness/Sweatiness).**

Strongly agree Strongly disagree

1                      2                      3                      4                      5

**5. The room air (stuffy/drafty) negatively affects my performance on the reading and test assignments (classwork/exams).**

Strongly agree  
disagree

Strongly

1 2 3 4 5

**6. I have difficulty focusing my attention on reading and test assignments (classwork/exams) because of the room air (stuffy/drafty).**

Strongly agree  
disagree

Strongly

1 2 3 4 5

**7. The room lighting negatively affects my performance on reading and test assignments (classwork/ exams).**

Strongly agree  
disagree

Strongly

1 2 3 4 5

**8. I have difficulty focusing my attention on reading and test assignments(classwork/exams) because of the room lighting.**

Strongly agree  
disagree

Strongly

1 2 3 4 5

**9. Glare (Shine) on the computer screen negatively affects my performance on reading and test assignments.**

Strongly agree  
disagree

Strongly

1 2 3 4 5

**10. Glare (Shine) on the computer screen negatively affects my performance on reading and test assignments.**

Strongly agree Strongly  
disagree

1 2 3 4 5

**11. The room sound levels (Noise) negatively affects my performance on reading and test assignments.**

Strongly agree Strongly  
disagree

1 2 3 4 5

**12. I have difficulty focusing my attention on the reading and test assignments because of the room**

Strongly agree Strongly  
disagree

1 2 3 4 5



**Appendix 4**

Environmental Attitude Questionnaire

**1. Do you feel comfortable in your current environment?**

Strongly disagree Strongly  
Agree

1      2      3      4      5      6      7

**2. Do you feel positive about your current environment?**

Strongly disagree Strongly  
Agree

1      2      3      4      5      6      7

**3. Do you enjoy being in your current environment?**

Strongly disagree Strongly  
Agree

1      2      3      4      5      6      7

**4. Do you feel that you learn well in your current environment?**

Strongly disagree Strongly  
Agree

1   2   3      4      5      6      7

**5. Do you feel that you would learn better in a classroom?**

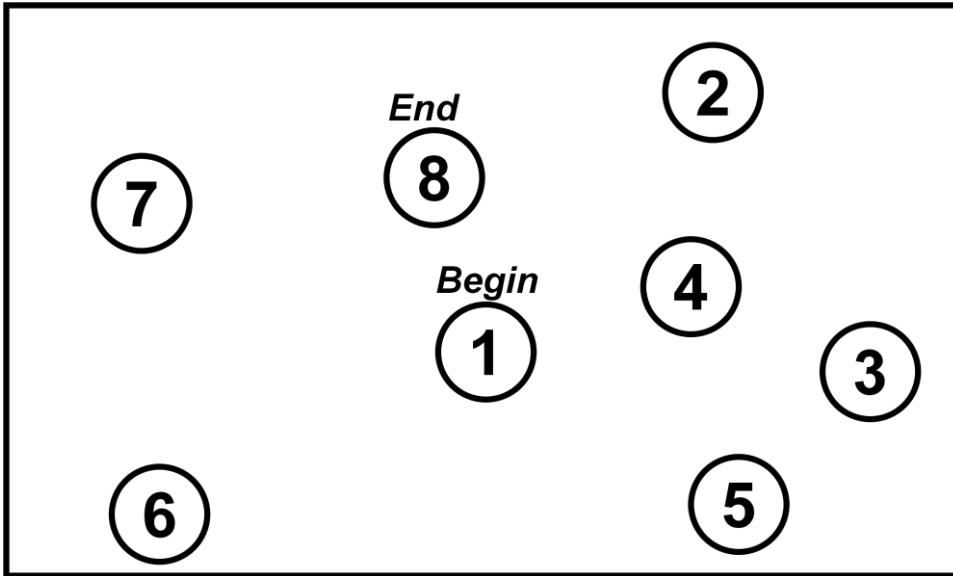
Strongly disagree Strongly  
Agree

1      2      3      4      5      6      7

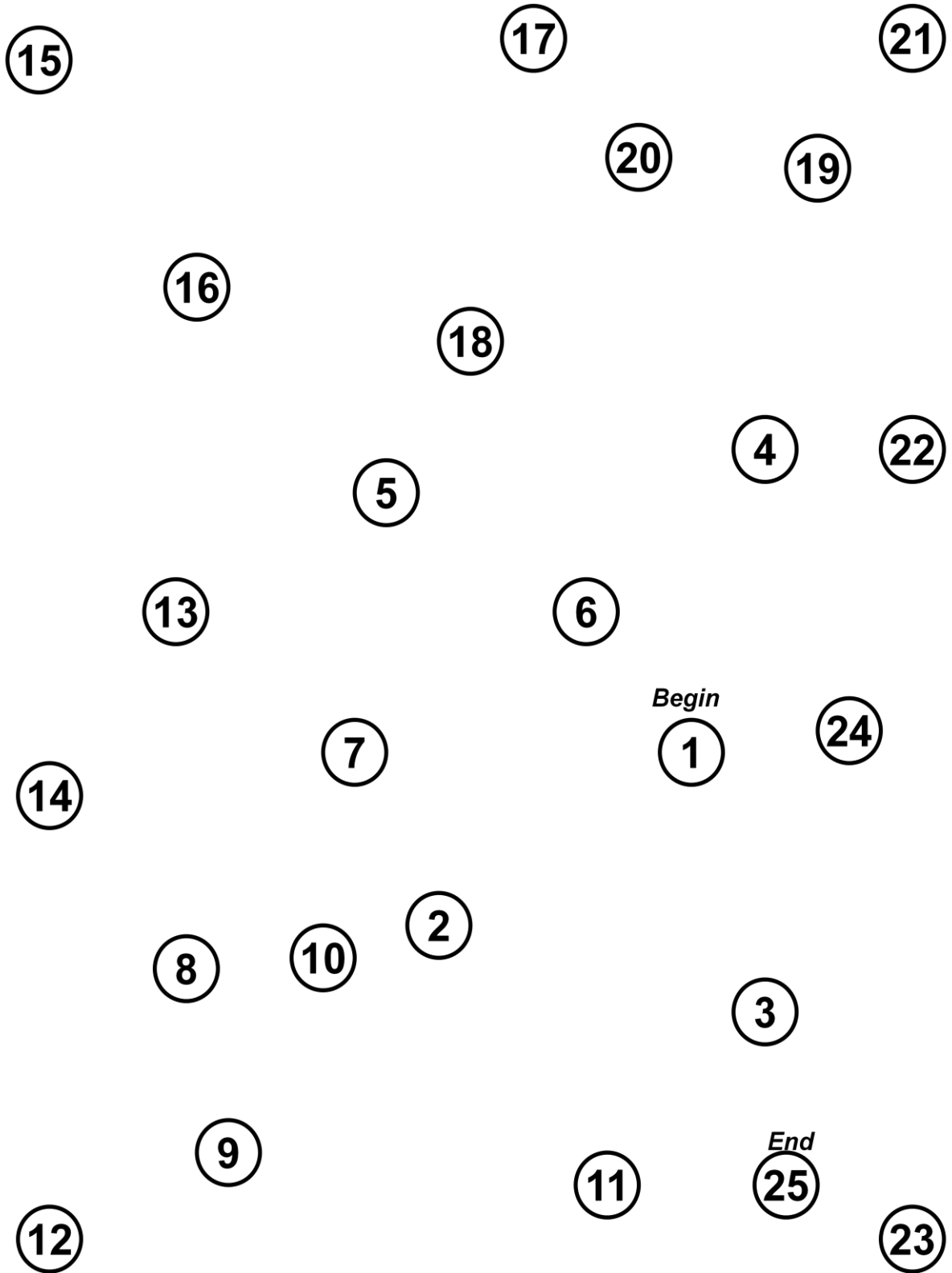
*Appendix 5*

*Trail making test (Measure of task performance)*

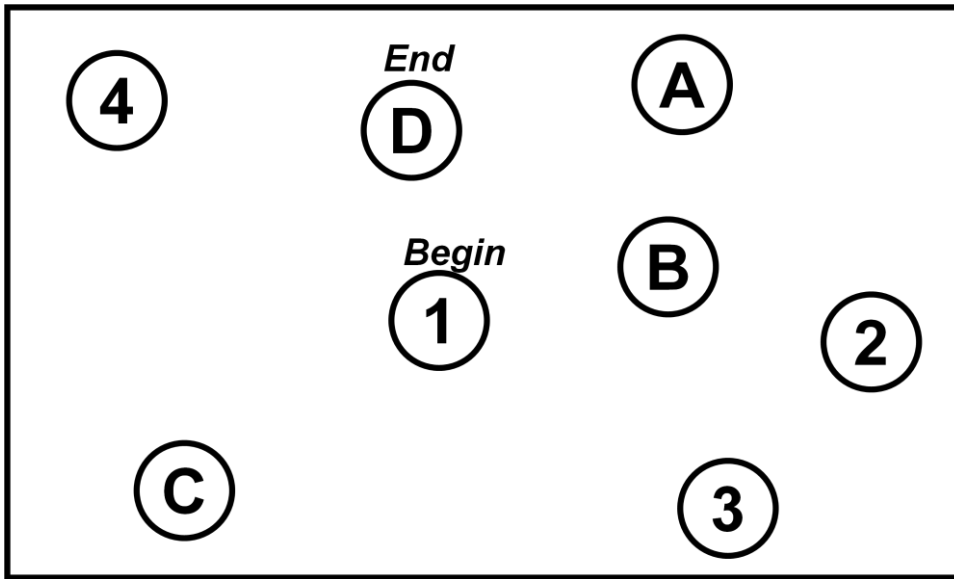
**Sample A**



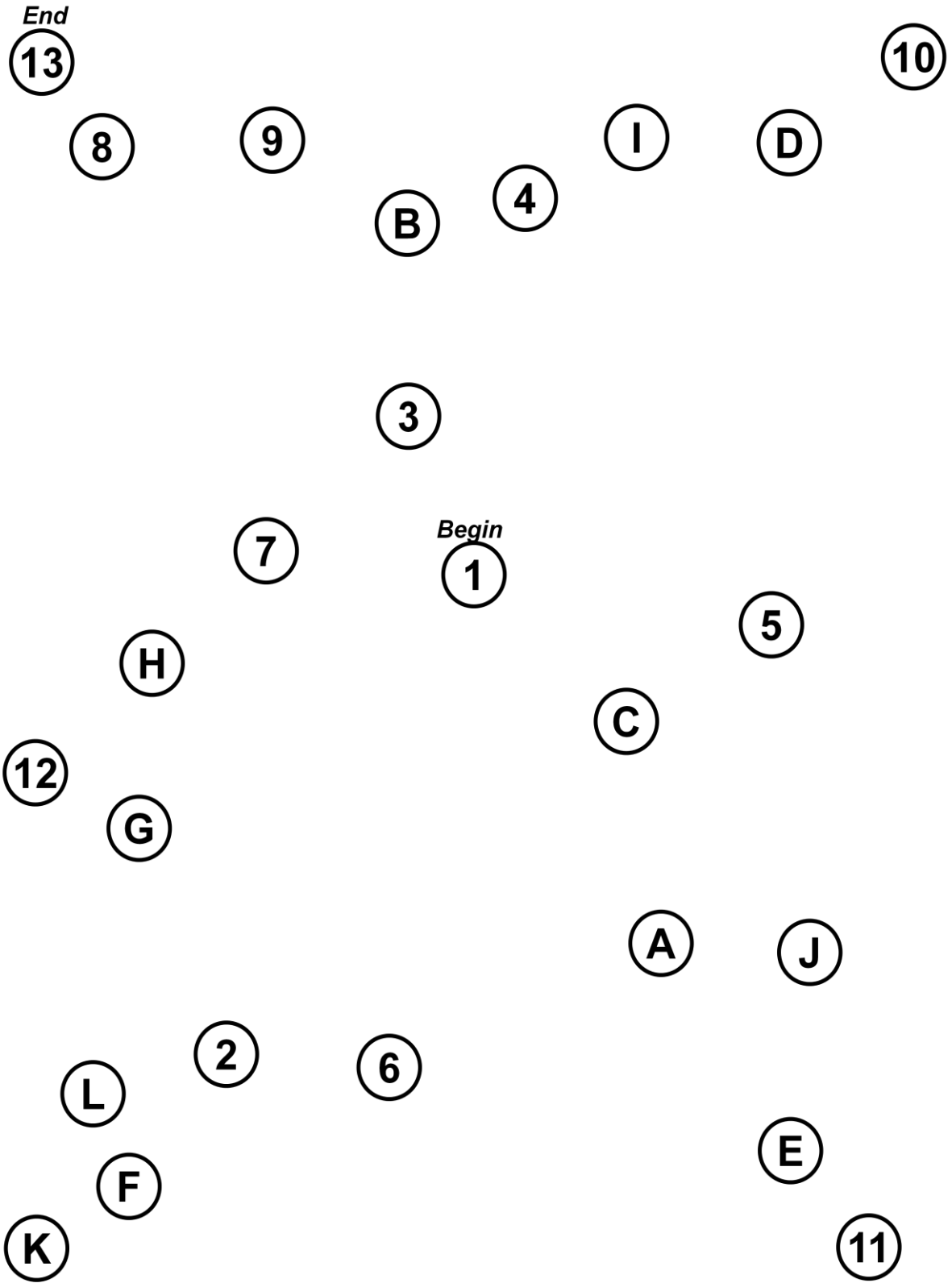
Test A



**Sample B**



**Test B**



## *Appendix 6*

### *Test instructions for teachers*

The first part of the study to conduct is the trail making test. To conduct these tests please do the following;

1. Put a countdown timer on the interactive whiteboard and set it for 5 minutes.
2. Inform the students with the use of the sample tests that they are required to connect all the numbers together in serial order.
3. Once explained inform the students that upon completion they must record their stop time.
4. Once all students have completed Test A they must move onto test B
5. Repeat step 1.
6. Inform the students that in this test they must connect the first number with the first letter in the alphabet and continue on. For example, 1 connects to A which connects to 2 which connects to B and so on.
7. Again inform the students that they must record their stop time.
8. After this is complete students can fill out the questionnaires in their own time.