

THE EFFECTS OF LEARNING GOAL AUTONOMY ON ACHIEVEMENT IN A  
TECHNICAL TRAINING COURSE: A SELF-DETERMINATION THEORY  
APPROACH

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IN A TECHNICAL TRAINING COURSE: A SELF-DETERMINATION  
THEORY APPROACH**

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**I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.**

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## **ABSTRACT**

### **THE EFFECTS OF LEARNING GOAL AUTONOMY ON ACHIEVEMENT IN A TECHNICAL TRAINING COURSE: A SELF-DETERMINATION THEORY APPROACH**

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Human resource is the key differentiator for market competence for companies and enterprises. Formal trainings are an important way for development of human resource. Every year, billions of dollars are spent on formal trainings. Transfer of training research states that, motivation to learn is an important parameter for effectiveness of trainings. According to Self-Determination Theory, feeling autonomy increases intrinsic motivation and causes better types of extrinsic motivation. Offering choice in goals is a way of providing autonomy.

In this research, effect of learning goal autonomy on achievement for an IT training course was studied. A mixed type research was implemented. In the experimental part of the study, experimental group had the learning goal autonomy in their course while control group had instructor determined learning goals. Pretests and posttests were conducted for both groups. According to t-test statistics, there was no statistically significant difference between control and experimental groups. Moreover, follow-up interviews were conducted. Interviews showed that choice in

learning goals were accepted positively by participants. But because of lack of knowledge on topics, they had no selection power with them.

According to this study, goal autonomy is not possible by providing straight explanations of topics, freedom to select, alternative topics and additional resources. Because novice participants lack field knowledge, they cannot evaluate course content and decide according to their needs and interests. This kind of autonomy is more appropriate for intermediate participants. If participants have intrinsic motivation besides field knowledge, they get the maximum benefit from goal autonomy.

**Keywords:** Motivation, Self-Determination Theory, Achievement, Goal Autonomy

## ÖZ

### ÖĞRENME HEDEFİ ÖZERKLİĞİNİN BİR TEKNİK EĞİTİM KURSUNDA BAŞARIYA ETKİLERİ: ÖZ-BELİRLEME TEORİSİ YAKLAŞIMI

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Yüksek Lisans, Bilgisayar ve Öğretim Teknolojileri Eğitimi Bölümü

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İnsan kaynağı, şirket ve kurumlar için pazar rekabeti açısından kritik öneme sahiptir. Resmi eğitimler, insan kaynağı gelişiminin önemli bir yoludur. Her yıl, milyarlarca dolar resmi eğitimler için harcanmaktadır. Eğitimin transferi araştırması gösteriyor ki, eğitimlerin etkinliği açısından öğrenme motivasyonu önemli bir parametredir. Öz-belirleme teorisine göre, özerklik hissi içsel motivasyonu artırır ve daha iyi dışsal motivasyon tiplerini doğurur. Hedefler için seçenek sunma, özerklik sağlamanın yollarından biridir.

Bu araştırmada, öğrenme hedefi özerkliğinin başarıya etkisi bir bilgi teknolojileri (BT) kursu özelinde incelenmiştir. Karma tip araştırma gerçekleştirilmiştir. Araştırmanın deneysel kısmında, deney grubu öğrenme hedef özerkliğine sahipken, kontrol grubu eğitimci tarafından belirlenen standart kurs hedeflerine sahip olmuşlardır. Her iki grup için de ön test ve son test yapılmıştır. T-test sonucuna göre kontrol ve deney grubu arasında istatistiksel olarak anlamlı bir fark bulunmadığı görülmüştür. Ayrıca, katılımcılarla görüşmeler gerçekleştirilmiştir. Görüşmeler göstermiştir ki, öğrenme hedeflerinde seçim hakkı sunulması katılımcılar tarafından

olumlu karşılanmıştır. Fakat kurs konularında yeterli bilgileri olmadığı için seçme gücüne sahip olamamışlardır.

Bu çalışmaya göre, hedef özerkliğinin konuların açıklanması, seçme özgürlüğü, alternatif konuların sunumu ve ek kaynaklarla sağlanamadığı görülmüştür. Acemi katılımcılar, alan bilgisi eksikliği nedeniyle, kurs içeriğini değerlendiremez ve kendi ihtiyaç ve ilgilerine göre karar veremezler. Bu tip özerklik orta ve ileri seviye katılımcılar için uygundur. Eğer katılımcıların alan bilgisine ek olarak içsel motivasyonları da varsa, hedef özerkliğinden maksimum faydayı elde edeceklerdir.

Anahtar Kelimeler: Motivasyon, Öz-Belirlemeli Teorisi, Başarı, Hedef Özerkliği



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## **LIST OF ABBREVIATIONS**

- SDT : Self- Determination Theory  
SDL : Self-Directed Learning

## **CHAPTER 1**

### **INTRODUCTION**

#### **1.1 Introduction to the Problem**

Today, organizations need high performing human resource to compete and succeed. According to Yamnill and McLean (2001), human resource is the critical differentiator for competence in the market. Similarly, Salas, Tannenbaum, Kraiger, and Smith-Jentsch (2012) states that, capable and trained workforce yields most sustainable advantage for the organizations. As market and conditions continuously change and organizations need to grow, development of their human resource is a must. An important way for human resource development is formal trainings.

According to Aguinis and Kraiger (2009), training activities provide benefits not only for organizations but also for individuals, teams and even societies. They state that training can provide benefits such as technical skills, self-management, planning and innovation for individuals. When it comes to organizational level, Aguinis and Kraiger (2009) states that, training can provide benefits such as reduction in employee turnover, increase in productivity, decrease in costs and improved quality. Moreover, countries adopt training programs to increase value of their national human capital and economic prosperity (Aguinis & Kraiger, 2009).

Each year, billions of dollars are spent on formal trainings globally. But, return of investment for trainings is still questioned. According to Saks (2002), only %44 of the training is transferred to the work place after 6 months. Clark (2011) claims that, technical trainings usually do not contribute to the organizational performance as expected. Transfer of training defines the application of knowledge, skills and

attitudes (KSA) gained in a training context to the job (Baldwin & Ford, 1988). It determines the benefits, organizations get from trainings. It is directly related to human resource development and costs. So transfer of training is a big concern for organizations. According to Baldwin and Ford (1988), training transfer can occur when learned KSAs are transferred to the job context and maintained over a long term.

Baldwin and Ford (1988) proposed a framework for transfer of training. Framework describes 3 input factors which affect amount of transfer. These are trainee characteristics, training design and work-environment characteristics. Trainee characteristics are ability, personality and motivation. Training design includes application of learning principles, sequencing of materials and job relevance of content. It is also evident that KSAs must be learned and retained to be transferred (Baldwin & Ford, 1988). Blume, Ford, Baldwin and Huang (2010) asserts that post training knowledge have small to moderate effect on transfer in their meta-analysis of 89 empirical studies.

Pintrich, Cross, Kozma, and McKeachie (1986) states that, “Although there is a variety of learner characteristics that influence learning and instruction, two of the most important are intelligence and motivation” (p. 613). According to Salas et al (2012), motivation to learn affects course attendance, effort exerted on learning and perseverance of application of learned materials to job context. So motivation is an important parameter for training transfer.

Self-determination theory (SDT) is about motivation. According to SDT, social context can facilitate or forestall motivation. Social context can do this by supporting or preventing competence, autonomy and relatedness. So motivating trainees is possible through providing them with autonomy, competence and relatedness. SDT specifies that, feeling autonomy enhances intrinsic motivation and causes better types of extrinsic motivation (Deci & Ryan, 2002; Ryan & Deci, 2000). Offering choice in goals is a way of providing autonomy (Su & Reeve, 2011; Jang, Reeve, &



Deci, 2010). Ryan and Deci (2000b) states that intrinsic motivation and autonomous extrinsic motivation are related with better learning and performance.

In this study, a mixed type research was conducted to understand how feeling autonomy in learning goal setting process affects achievement in a technical training context. It is expected that, perceived autonomy will increase and motivation will be affected positively. SDT expects increase in intrinsic motivation and better forms of extrinsic motivation for the training.

This study will allow us to understand influence of SDT on training motivation. Specifically, it will investigate the relation between goal autonomy and achievement in a technical training context.

## **1.2 Purpose of the Study**

In this study, it will be investigated that how autonomy in selection of course objectives affects achievement in a training course.

Autonomy in goals is not universal in training field. For example, learning how to operate a machine may not allow customized goals. But especially in information technologies technical training field, it is very possible. Power of computers comes from being programmable. Different job contexts can use different side of this environment. So, participants can demand personalization of goals for a better fit with their job environments.

## **1.3 Research Questions**

Our research questions are the following;

1. Is there a difference between the gain scores of students with autonomy in learning goals and those without autonomy in learning goals in a technical training course?

2. What are the participants' perceptions pertaining to the learning environment and learning goal autonomy?

#### **1.4. Significance of the Study**

This study is important in two directions. Firstly, higher levels of training transfer will be possible. Secondly, SDT research studies will be richer by addition of technical training field and goal autonomy research.

Organizations continually invest in training for their human resource development. According to 2013 Training Industry Report, \$55.4 billion has been spent on formal trainings only in US. Return of investment for trainings is still doubtful. Increasing the benefits of trainings is critical for organizations. This will help organizations to get a competitive advantage and cost savings.

Training transfer will be positively affected by trainee motivation (Baldwin & Ford 1988; Ford & Weissbein, 1997). Giving autonomy in determining learning goals will result in better fitted and more relevant trainings. Salas et al. (2012) states that, motivation to learn is an important parameter for effective trainings and can be improved by increasing relevance to job demands. According to Grossman and Salas (2011), trainee motivation is a significant contributor to transfer. Moreover, Self-determination theory can help us here by providing greater intrinsic motivation or higher quality extrinsic motivation. There is a strong relationship between motivation and learning (Ryan & Deci, 2000b).

Second importance comes from addressing the gaps in Self-Determination Theory. These gaps are application of SDT on technical training field and goal autonomy.

According to self-determination theory, autonomy causes increase in performance (Miserandino, 1996) and higher quality learning (Grolnick & Ryan, 1987) in school environment. But, these findings were not tested in technical training environment. Specifically, application of SDT specified autonomy to increase motivation was little

researched in a technical training context. When it comes to training, SDT studies focused on physical and sportive type trainings.

Secondly, there are not many studies on goal selection type of autonomy in SDT literature. In terms of goals, SDT studies examine goal context which specifies whether goal is pursued by autonomously or in a controlled way. Autonomy can be supported by any means specified by SDT (giving choices, providing meaningful rationale, acknowledging negative feelings etc.). In this study, method of autonomy is choice in goals and it has not been researched much. This can be due to, relatively persistent nature of course contents and curriculum in education settings. Moreover, mixed type research will help us to look at phenomenon both qualitatively and quantitatively.

### **1.5 Definitions**

- Self-Determination Theory (SDT): It is a theory of motivation.
- Autonomy: According to SDT, “Autonomy is to behave with a sense of volition, willingness and congruence; It means to fully endorse and concur with the behavior one is engaged in” (Deci & Ryan, 2012)
- Goal Selection: Goals and course objectives are used interchangeably. Participants are given autonomy to select course goals. This selection is guided by student interests and personal goals. Selection according to being easy or failure avoidance feeling is not aimed.
- Achievement: In this study’s context, it is how well course objectives are grasped by participants. It is defined as gain scores between pretest and posttest scores.



## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 Self-Determination Theory**

Motivation term was derived from the Latin word “movere” which means “to be moved”. Motivation is what gives intensity and direction to our behaviors (Frymier, 1970). Intensity implies how much effort put forth to attain a goal. Direction implies selection of specific goal among others. Motivation tries to answer “why” question for our behaviors.

Self-Determination theory is a theory of motivation. It states that every human has three innate psychological needs, namely competence, autonomy and relatedness (Ryan & Deci, 2000b). Feeling competence is coping with environment successfully. Feeling relatedness is having valued others as well as having others valuing her. Feeling autonomy is having actions emanating from authentic self. If these psychological needs are satisfied by social context, motivation will be affected positively.

Motivation may be seen as a single phenomenon having only amount as discriminator. According to this, one may have lack of motivation or great amount of it. But later, scholars have put another parameter which is goal or “why of motivation” (Ryan & Deci, 2000). Motivation may be distinguished according to reasons or goals. After this distinction, we have 2 types of motivation namely intrinsic motivation and extrinsic motivation.

Intrinsic motivation is doing something for its inherent satisfaction (Ryan & Deci, 2000). This kind of motivation causes action for fun, curiosity or challenge included in the action itself. For example, a student may do her homework for curiosity and interest. Intrinsic motivation is related with better learning and performance (Ryan & Deci, 2000b). The basic features of intrinsic motivation are seeking novelty and challenges, extending and exercising one's own capacities, exploring and learning new things. Starting from birth, children consistently show behaviors such as assimilation, mastery, exploration of environment even in the absence of external reward. This intrinsic motivation is essential for cognitive and social development not only in childhood but also throughout life (Ryan & Deci, 2000b).

One type of measure for intrinsic motivation is "free choice" scale. Other measure is self-reports on enjoyment and interest (Ryan & Deci, 2000). Free choice measure is generally conducted in a specially designed environment. After the specific activity, participants are left alone in an environment with various alternative activities. Participants are observed whether they returned back to the specific activity or other alternative activities in the environment. In this study, self-reports were used to measure before-the-training intrinsic motivation as free choice scale is not applicable in this case.

Extrinsic motivation, on the other hand, is doing something in sake of separable outcome such as reward and punishment. Action is used as an instrument to reach another goal. For example, a student may do his homework for parental approval. As children exit childhood, it becomes more pervasive to see extrinsic motivation. Children encounter social demands for non-interesting tasks (Ryan & Deci, 2000). They adopt social norms and regulations by what SDT calls as internalization.

Edward Deci found that external tangible, contingent rewards undermine intrinsic motivation (Deci, 1971). In fact, not only tangible rewards but also threats, deadlines, pressured evaluations and imposed goals led to decrease in intrinsic motivation (Ryan & Deci, 2000b). Deci (1971) explains this finding as people feel controlled in such circumstances. This has led to importance of autonomy in

motivation. SDT groups motivation according to autonomy. It also states different levels of extrinsic motivation according to self-determination (i.e. autonomy). SDT recommends taxonomy of motivation in the form of continuum as in figure 2.1.

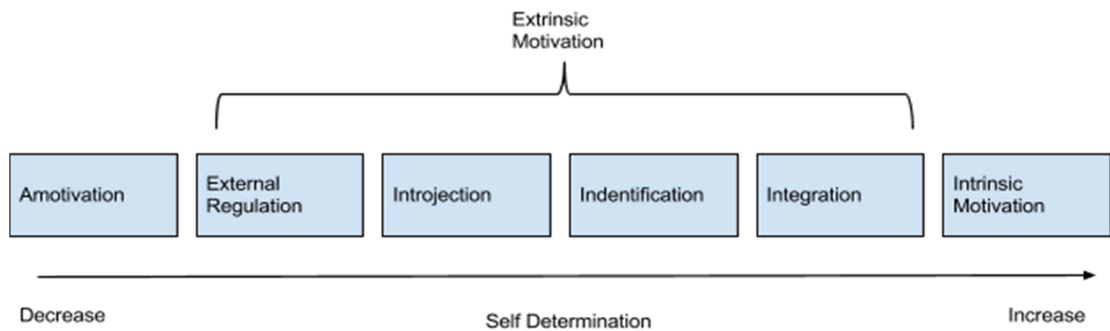


Figure 2.1 Self-Determination Continuum

Amotivation is lack of motivation. In that case, a person does not find goal valuable, not feel competent to do it or not expect a desired outcome to happen (Ryan & Deci, 2000). After amotivation, extrinsic motivation comes. As the self-determination increases, the quality of extrinsic motivation increases.

External regulation is the least self-determined type of extrinsic motivation. A person performs an act in order to satisfy some external demand (Ryan & Deci, 2000). This external demand may be in the forms of reward or punishment. For example, a police can make a luggage control in an airport. A person, who is required to open her luggage and allow police, behaves according to external regulation. It was assumed that, that person does not feel endorsement for this behavior. In external regulation, a person does not value activity or feel interested. When failure occurs, people tend to blame others for this outcome (such as parents or teachers).

When we don't perform a behavior, we may feel anxiety or when we perform a behavior we may want to get pride or feel self-worth. If this is the case for a behavior then it is introjected type of extrinsic motivation. These kinds of behaviors are partially internalized. They are within the self but not integrated to the self yet (Deci & Ryan, 2002). For example, a student makes her homework to feel like a good person or a person uses his vote in an election because he feels guilty if not. Ego involvement concept is salient here. Person behaves to maintain self-esteem or feel

self-worth (Ryan & Deci, 2000). When failure occurs, a person tends to feel anxiety and it is very hard to cope with failures.

When a person understands importance of an activity for herself, then we may say that behavior is identified type of extrinsic motivation. She understands how this activity serves to her goals. Identification allows person to feel a sense of choice and volition (Deci, Vallerand, Pelletier & Ryan, 1991). For example, a student may want to finish her school because it is possible to find a good job after graduation.

A person may internalize a behavior in such a way that it is perfectly congruent with other values of the self. If this is the case, then this is integrated type of extrinsic motivation. For example, a person may study hard on her research project. If that person has a sense of “I am a scholar” and other personal values are coherent with this perception, studying research project can be an integrated behavior.

Intrinsic motivation is the most autonomous form of motivation. Starting from birth, humans grow and act according to their own inherent interests. They act intrinsically motivated. With the childhood, they are forced to internalize social norms and responsibilities. So they start to act extrinsically motivated. But growing intrinsically motivated still valid in other parts of the life (Ryan & Deci, 2000).

Some types of extrinsic motivation leads to endorsement of task because of its utilization or importance for the self. This distinction is important because most of the educational materials are not enjoyable or interesting. It has been shown that more autonomous forms of extrinsic motivation results in high quality learning and better performance (Ryan & Deci, 2000). This high quality learning means conceptual or deeper understanding of the subject. Rote learning may occur in other forms of motivation.

Compared to other theories of motivation, SDT has a unique proposition for the school environment. SDT implies that every human has inner motivational resources.



Instructor's job is to tap into these resources to get motivation on learning (Christenson, Reschly, & Wylie, 2012, p.152).

SDT is a macro motivation theory consisting of 4 mini theories. The following part explains each mini theory.

### **2.1.1 Cognitive Evaluation Theory (CET)**

CET describes how social context affects intrinsic motivation. CET specifies that competence and autonomy are integrated into intrinsic motivation. What affects autonomy and competence, automatically affects intrinsic motivation (Deci & Ryan, 2002).

CET uses DeCharms (1968) perceived locus of causality (PLOC) for autonomy need. PLOC simply defines whether a person sees herself as the causal agent for her behaviors. If an event perceived as external locus, intrinsic motivation will be low. CET specifies this kind of event as controlling. Threats of punishment, deadlines, imposed goals, surveillance, competition and external evaluations are all controlling and diminish intrinsic motivation (Deci & Ryan, 2002). On the other hand, if an event is perceived as informational, it does not diminish intrinsic motivation. For example, positive feedback may be perceived as "being competent" and not as controlling. Positive feedback should be expressed in a non-evaluative environment for this.

The other component integrated in to intrinsic motivation is competence. When environmental or social factors cause perceiving competence, intrinsic motivation will increase. Optimal challenges and positive feedback cause perceived competence (Ryan & Deci, 2000b).

SDT specifies that feeling competent must be accompanied with feeling autonomy to increase intrinsic motivation. Feeling competent in a controlling environment does not yield increase in intrinsic motivation (Ryan & Deci, 2000b).

SDT states that, if people feel autonomy and competence while doing an activity, intrinsic motivation will be high. But it does not state that feeling competent and autonomous will cause an activity to turn into an activity of intrinsic motivation. CET does not work on how to convert an activity into an intrinsic type but rather it tries to identify how social or environmental contexts can foster or undermine intrinsic motivation. Intrinsic motivation leads to high-quality learning and creativity, so it is important to know how we foster this type of motivation (Ryan & Deci, 2000)

When applied to training context, CET implies that feeling autonomy and competent causes higher levels of intrinsic motivation. In this study, goal autonomy should allow better motivation. This should turn out to better performance and deeper learning.

### **2.1.2 Organismic Integration Theory (OIT)**

OIT defines different types of extrinsic motivation and explains internalization or integration of external regulations. Internalization concept tries to identify taking in of externally imposed regulations and how those become our behaviors. It reveals that, there are different kinds of extrinsic motivation. It proposes self-determination continuum as specified above. It is important to notice that, a person does not start this continuum from the very beginning far left and progresses in the continuum to the far right. A person can start anywhere in the continuum and can stop any other place (Ryan & Deci, 2000). Generally, people internalize more according to SDT over the life span. But it is possible that one can lose interest or value and go backward in the continuum because of the environmental factors.

How can we provide more internalization? SDT states that autonomy has critical importance here. Autonomy means, a person is the sole author of his actions. Activities originate from person's self. According to SDT, understanding importance

of behavior for personal goals is important. We can provide more autonomy with opportunities for self-direction, choice and acknowledgement of feelings.

Relatedness is also important for internalization. Because social responsibilities are not inherently interesting and joyful, it is not possible to internalize those with intrinsic motivation. Introduction to social responsibilities starts with prompt from significant others. Significant others may be our parents or teachers. We feel connection and relation to these people. They value us and we value them. Significant others present social norms to us and gradually, these norms are internalized (Ryan & Deci, 2000).

Competence is required for internalization as without feeling competence, one cannot perform the activity. He will declare an excuse (Deci & Ryan, 2002).

In training context, better forms of extrinsic motivation will be possible through feeling competent, relatedness and autonomy. In this study, goal autonomy is expected to cause better types of extrinsic motivation.

### **2.1.3 Basic Needs Theory**

SDT also generalizes itself to well-being and life satisfaction (Deci & Ryan, 2002). It states that feeling competent, autonomous and related will cause well-being and life satisfaction.

Humanistic psychology and cognitive developmental theories imply that, humans have innate tendency for growth and integration. Starting from birth, they actively explore and learn new things. They have a tendency to synthesize, organize and unify a coherent sense of self. On the contrary, behaviorists and some post-modern theorists say that humans show fragmented behaviors according to environmental conditions. Humans do not aim growth but give response to environmental stimulus (Deci & Ryan, 2002).

SDT integrates these two perspectives by providing organismic dialectical perspective. SDT posits that humans have natural tendency for growth, development of unified sense of self but it cannot be taken for granted. Contextual factors may support or thwart this tendency. These factors are known as basic needs (Deci & Ryan, 2002).

Like physiological needs (such as food and water), people need psychological nutriment. These nutriment, namely autonomy, competence and relatedness, are called as basic psychological needs within SDT. Basic needs are essential for well-being and healthy functioning (Deci & Ryan, 2002). Moreover, basic needs are universal. This means they are innate for human beings and does not change according to culture, education level, socio-economic status, gender, age etc.

There are two kinds of well-being; subjective and psychological well-being (Deci & Ryan, 2002). Subjective well-being is hedonic type and equated to happiness. SDT is not interested with this type. Psychological well-being, on the other hand, is eudaimonic and equated to being fully functioning (Deci & Ryan, 2002). It may be seen as meaningful life with happiness. SDT basic needs contribute to the psychological well-being.

Kasser and Ryan (1993) studied people's aspirations or life goals and their effect on well-being. Intrinsic aspirations, like community contribution, personal growth and affiliation, provide satisfaction of basic needs. Extrinsic aspirations, like fame, wealth and image, provide external signs of worth. They found that although people might feel happy while attaining extrinsic aspirations, this does not contribute to psychological well-being.

#### **2.1.4 Causality Orientations Theory (COT)**

SDT specifies that everyone has inner motivational resources and these can be vitalized by social context. COT describes motivational orientations for individuals according to these social motivational contexts (Reeve, 2012). Social context provide

support for autonomy, competence and relatedness but response to these supports differ in personal level. It gives the answer for “Why same environmental context did not create the same effect on every individual”.

COT implies three orientations at individual level. Autonomy orientation implies acting according to values and interests. It shows tendencies of individuals towards intrinsic and integrated type extrinsic motivations. Controlled orientation implies acting according to directions and controls imposed by environment. It shows tendencies of individuals towards introjected and external regulation type motivations. Impersonal orientation implies not behaving intentionally. It shows tendencies of individuals towards amotivation. General Causality Orientations Scale (GCOS) is used to measure causality orientations for individuals. A person gets score for all three orientations. Higher scores mean stronger inclination for that type of orientation.

## **2.2 Technical Training**

Combs and Davis (2010) defined training as “the process to obtain or transfer knowledge, skill and abilities needed to carry out specific activity or task”. It can be seen from this definition that, training directly addresses ability to do specific activity after the training event. Learning how to ride a bicycle is a kind of training. This is the discriminating feature of training from education which aims conceptual or theoretical content acquisition.

Clark (2011) defines technical training as “structured learning environment engineered to improve workplace performance in ways that are aligned with bottom-line business goals”. She identifies technical training as a process rather than discrete time event. For this, Clark (2011) recommends that, technical training should include before and after the training components such as resources and activities. This definition also highlights the importance of workplace performance as an output for technical trainings.

Combs and Davis (2010) defines technical training according to content. If content is related to any technology or specific to a discipline, function or profession then it is called as technical training. Similarly, Holton and Swanson (2009) also defines technical skills training and development according to content which is tool or system specific. These definitions distinguish technical trainings from soft-skill trainings (presentation, communication, becoming team etc.). Technical trainings are focused on discipline or tool. Technical trainings can be seen on topics such as engineering, manufacturing, IT operations etc. (Williams & Nafukho, 2015)

Combs and Davis (2010) defines IT training as “Training on content involving the development, maintenance and use of computer systems, software and networks” (p. 13). They define IT training as one aspect of technical training.

In this study, it was preferred to use technical training instead of IT training. It was expected that, findings of this study will be applicable to wider fields of technical training by this preference.

### **2.3 Goals**

In this study, it was expected to find positive relation between goal autonomy and achievement which affects training transfer. Goals have a special place in achievement. Research studies approached goals according to 3 perspectives; Goal context, goal content and goal orientation. Goal context specifies whether goal is pursued by autonomously or in a controlled way. Autonomy can be supported by any means specified by SDT (giving choices, providing meaningful rationale, acknowledging negative feelings etc.). Goal content specifies whether goal is intrinsic or extrinsic type. Goal orientation is the last dimension and research vastly studied mastery or performance oriented goals and their effects on learning.

SDT is mostly interested with goal context. Research shows that autonomous goal context have better outcomes compared to controlled ones such as persistence, creativity and performance (Ryan & Deci, 2000b).

For example, Wang (2013) investigated 4 possible arrangements of goal contents and contexts with appropriately prepared instruction sheets. These are intrinsic goal in an autonomy-supportive learning context (type I), intrinsic goal in a controlling learning context (type II), extrinsic goal in an autonomy-supportive learning context (type III) and extrinsic goal in a controlling learning context (type IV). Test performances were found according to the following order; type I, type III, type II and type IV. This result suggests that autonomy supportive goal contexts resulted in better test performance for students compared to controlled environments. Autonomy support gives benefit for both intrinsic and extrinsic goal contents

Goal content was also researched well. Consensus is intrinsic goals have better outcomes compared to extrinsic ones. For example, Wang (2013) investigated effects of goal content on learning. Goal content was manipulated with instructions and its effect on learning was measured. It was found that intrinsic motivational reasons have better positive outcomes regarding test performance. So as a practice in classroom, it is better to specify intrinsic motivational reasons instead of extrinsic ones. Similarly, Vansteenkiste, Lens and Deci (2006) specified that the more intrinsic the learning goals, the deeper the learning. If teachers frame course goals according to intrinsic motivation such as self-growth, becoming healthier or contributing to the community, deeper learning will take place. If extrinsic goals are framed, rote learning takes place for the short-term. This is because intrinsic goals are more related with basic needs and well-being according to SDT theory.

For goal orientation, there is a well-established achievement goal theory which tries to identify reasons for achievement. There are four orientations for goals. Three of them are mostly cited in related research. Each case has different implications for learning and behavior. Lots of studies relates with SDT to explain certain autonomy situations. Goal orientations may be in the following types:

- Performance goals: A person demonstrates his ability for the target task relative to others.

- Mastery goals: A person tries to get mastery compared to past self.
- Avoidance goals: A person tries not to be seen as incompetent compared to others.

Ames (1992) studied achievement goals and their effects on learning. Mastery goals promote developing of skills relative to self or past performance. Performance goals promote the demonstration of skills relative to others. If a person has mastery goals, he believes in that success is an output of effort. That person tries to develop new skills/knowledge, tries to reach beyond her self-standards. She feels mastery (ability) according to her past self.

On the other hand, performance goals cause a focus on one's own abilities and ego (worth). One feels ability when she performs better than others. Self-worth is determined by her ability to perform.

Mastery goals foster involvement with the task but performance goals foster a failure avoiding pattern of motivation. Ames (1992) states that, mastery goals have positive impact on learning. For example, students spend more time on learning activities, easily take risks and do challenging tasks, engage actively with the content. Mastery goals cause deep information processing during learning tasks and help to establish efficient self-regulated strategies. These benefits explain how mastery goal orientation positively affects students' performance on tasks requiring long-term retention.

To support mastery goal orientation, Ames (1992) recommends some structures to classroom environment on design of learning activities, some evaluation practices and autonomy support for students. Autonomy can't be possible if students choose the way to minimize effort, protect self-worth or avoid failure. Students must decide on interest. Teacher should not provide freedom of action but identify and present choice according to student's interests. For this study, this is an important point to notice. To prevent selection of goals according to being easy or failure avoidance feeling, course goals will be related to personal goals and interests. Course goals will



be explained and tied to business goals at the beginning of the course. Otherwise, it will not be possible to establish autonomy

Harackiewicz and Elliot (1993) investigated the effect of achievement goals on intrinsically motivated (enjoyable pinball game) task. Ames (1992) showed that performance goals have negative effects such as challenge avoidance, negative emotions and problem in coping with failures. According to Harackiewicz and Elliot (1993), these mostly occur in low competence levels.

Harackiewicz and Elliot (1993) conducted 2 experiments with 60 and 104 participants respectively to study this effect. In these experiments, they manipulated the goals of participants as mastery or performance goals. This research shows that, for high achievement oriented participants, performance goals enhanced intrinsic motivation whereas for low achievement oriented participants, mastery goals enhanced intrinsic motivation. Research concludes that achievement orientation of individuals has a better determinant than type of goal orientation on intrinsic motivation. It is important that the type of task is intrinsically motivated so it must be evaluated in this context.

In this study, most of the participants are expected to be in novice level. Using such forms and regulating goals according to this finding can be beneficial in classroom settings. But for this study, it will increase the complexity and will not be in this study's scope. Mastery goals are assumed and no other factor is considered.

Research shows the effect of autonomous goal context on goal orientation and goal content. According to literature, autonomous goal context positively affects extrinsic and intrinsic goal contents (Wang, 2013; Ryan & Deci, 2000b). Autonomous goal context help students to build mastery type goal orientation (Madjar, Nave, & Hen, 2013).

In this study, goal contents were measured to see its effect according to autonomous goal context. Goal contents, whether participants have intrinsic or extrinsic type of

motivation, were measured by self-reports collected with interview questions. It is expected that intrinsic motivation within autonomous context will yield the best performance.

Most of the research investigated only specific kinds of autonomy increasing activities. For example Wang (2013) employed controlling (must, have to) and autonomous (should, can) directives. Learning goal type autonomy was less encountered in the literature.

Learning goal autonomy may be seen as a way of nurturing growth. This type of autonomy may be encountered in Carl Rogers' significant learning theory and Montessori Method.

Rogers (1970) states that, anything taught to another has little or no significant influence on behavior. He recommends creating a learning climate. This learning climate can be established by realness of facilitator, emphatic understanding and acceptance of students. Rogers (1970) states that, "The facilitator helps to elicit and clarify the purposes of the individuals in the class as well as the more general purposes of the group". According to Rogers, motivation to learn and change stems from self-actualizing tendency (Rogers, 1995). This is a tendency for organism to flow into channels of potential development.

Montessori Method tries to establish an education system where one chooses to act according to his values and interests (Lillard, 2005). It awakens the interest inside the child and allows him to pursue his own learning according to his interests.

With this study, it was tried to find answer to the question: "What will happen if we get students to follow their own goals in a subject matter". Learning goal autonomy was tried to be established according to participants' interests, needs and personal values. It was expected that change and personal development would be possible.

## **2.4 Choice and Autonomy**

Providing choice results in conflicting outcomes according to research. Katz and Assor (2007) states that, some studies found beneficial outcomes, some found positive outcomes for only some of the measures and some found no impact and even negative outcomes.

Katz and Assor (2007) asserts that choice must feed one of the three basic psychological needs, namely, competence, relatedness and autonomy, to become beneficial. If a choice does not serve a need, then, it does not contribute autonomy and indirectly to motivation.

For the autonomy-enhancing choices, they mention Ullmann-Margalit and Morgenbesser's (1977) "choosing" and "picking" study. If an option allows a person to realize his/her values and preferences then this is known as choosing. If it does not serve one's preferences, it is called as picking. Choosing serves autonomy and motivation although picking does not. According to this, Katz and Assor (2007) states that, if an option is valuable according to personal values, interests and goals then it feeds autonomy and increases motivation.

In the context of competence-enhancing choices, Katz and Assor (2007) discusses complex decision making environments. If a decision requires consideration of many attributes, simpler cognitive processes will be executed. In other words, when a person cannot handle choice selection process, she tends to select default ones or decide not to choose. If a person realizes that, she is not competent in this selection process, this diminishes motivation. For a choice to be competence-enhancing, it must be in optimal difficulty level for the decision maker.

In this study, most of the participants were expected to be novice level. Novices are not competent to select goals. According to Katz and Assor (2007), this makes goal autonomy useless for novice participants. To cure this problem, Edward Deci

recommends explanation of course content and identification of how those content contribute to personal and professional goals and interests of the participants.

## **2.5 Self-Directed Learning**

Knowles (1975) defines Self-Directed Learning (SDL) as

process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies, and evaluating learning outcomes (p. 18).

It can be seen that “formulating goals” or “goal autonomy” is also a study topic under SDL. Self-directed concept is very similar to autonomy. In each case, perceived locus of control is internal to learner. Kop and Fournier (2011) states that, learner autonomy is an important component in self-directed learning.

Andragogy describes how adults learn. One of the central tenets of andragogy is “readiness to learn”. Adults learn better when their life situation creates a need to know (Knowles, Holton, & Swanson, 2014). Moreover, readiness for self-directed learning is another topic studied under andragogy. Different scholars (Knowles, Holton, & Swanson, 2014; Pratt, 1988; Grow, 1991) studied Readiness for SDL. Pratt (1988) recognizes that being self-directed is highly situational. In one learning situation, a person may be highly self-directed while in another may be dependent and unsure. According to Pratt (1988), two core dimensions determine this situational self-direction, namely direction and support.

Direction shows need for assistance for the learner. It is inversely proportional to learner’s competence and dependency in a specific content. If a learner’s competency high and dependency low, she will need less direction from instructor.

Otherwise, instructor must provide clear directives, specific guidance with high task orientation.

Support dimension shows emotional support for the learner. It depends on two factors, namely confidence and commitment. A learner may have low commitment to learning objectives and have low confidence for her ability to learn. In this case, instructor should provide learner with supportive and encouraging feedback.

Pratt (1988) proposes a four-quadrant model to determine the learner's position. According to this position, instructor should provide a mix of supportive/directive responses to learner. In quadrant 1, instructor provides both direction and emotional support in a high degree. In quadrant 2, only direction is needed. Learner may have already commitment and confidence for the learning objectives. In quadrant 3, there is already competence in the content but affective support is needed. In quadrant 4, self-directed learning is much more possible.

It is expected that, adult learners will move gradually to quadrant 4 after appropriate responses in direction and support dimensions.

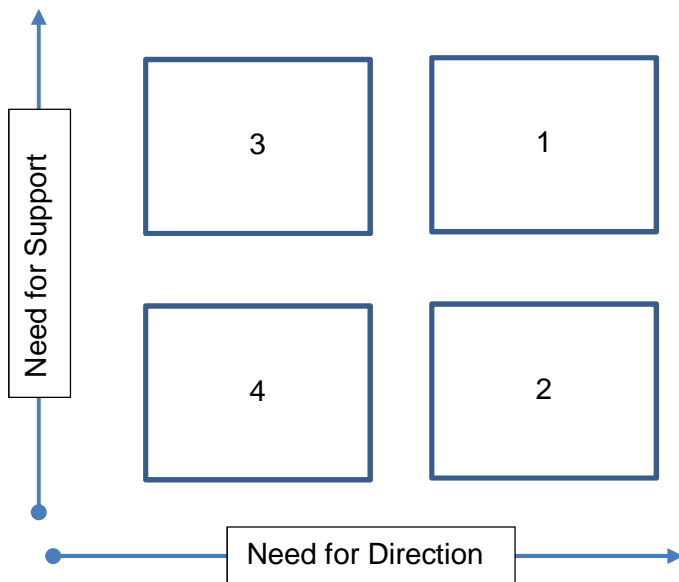


Figure 2.2 Pratt's Model for Direction and Support

Similarly, Grow (1991) suggests staged self-directed learning (SSDL) model to describe readiness for self-directed learning. The model was inspired by Hersey and Blanchard's Situational Leadership concept. Grow suggests SSDL to make learners more self-directed. He states this as the main goal for educational processes.

SSDL has four stages where students may be found. At each stage, teacher should have different style of instruction and prepare students to go upper stages.

In stage 1, student is dependent. He needs clear directions from an authority (expert) figure. Students depend on teacher for what they need to know. They are dependent because they lack required knowledge and skills or they lack necessary confidence for their abilities (Grow, 1991).

Grow advises not to give choice to stage 1 learners, because their position needs clear directives (Grow, 1991). But to get learners advance in stages, he advises insight methods such as developing critical awareness of one's life situations, needs analysis and goal-setting (with learners). Although these insight methods may be used for stage 1 learners, they are more appropriate for stage 3 learners. This is important for this study as we expect to have commonly stage 1 learners in the training class. This advice conflicts with the SDT's claim about autonomy and its effect on performance and learning in universal way.

Although giving directive instructions are not SDL, Grow defends this for stage 1 learners. He asserts that problem only arises when stage of the learners and teacher attitude do not match.

Stage 2 learners are called as interested and teacher role becomes motivator. In this stage, learners are interested or interestable. Teacher should tie outcome of learning to interests or values of learners. This reminds autonomy concept in SDT. Providing meaningful rationale is an intervention to increase autonomy. The main job of the teacher is to bring motivation and enthusiasm to the class. Personal relations are also

important in this stage and will motivate students. Teacher should practice goal-setting with learners in this stage to advance their self-directedness.

In stage 3, learners have necessary knowledge and skill to participate in their own learning, especially in goal-setting process. Instead of what they should feel, they try to understand how they feel. They value their own and others' life experiences. They see themselves as co-authors of the culture they are living in. Teacher becomes facilitator and gives well-designed but open-ended projects. Learners are open to collaborative group studies.

Stage 4 learners are truly self-directed. They determine goals and standards for their performance. They take responsibility for their own learning. Teacher should behave like a delegator or consultant. Her main purpose is to become unnecessary for the learner. Teacher may challenge learner and step back.

According to Grow's model, goal autonomy can only be achieved truly with stage 3 and 4 learners, which are expected to be very rare in this study's classes.

Pratt (1988) and Grow's (1991) studies show that self-direction is not an already possessed property for learners. Similarly, it may be concluded that autonomous goal pursuit is not possible for each learner. They may need directive and supportive help from instructor.

## **2.6 Adult Learning**

There is no single learning theory which explains human learning completely. Like this, there is no single adult learning theory which explains adult learning completely. Instead, there are models which contribute to our understanding of adult learning (Merriam, Caffarella, & Baumgartner, 2007). One of the best known adult learning theories is andragogy. It was established by Malcolm Knowles.

Contrasted to pedagogy which explains how to help children to learn, andragogy tries to explain how to help adults to learn (Merriam, Caffarella, & Baumgartner, 2007). Andragogy has 6 assumptions about adult learning. These are essential characteristics when designing learning programs for adults (Merriam, Caffarella, & Baumgartner, 2007).

1. The need to know: Adults learn better when they are aware of need for learning (Knowles, Holton, & Swanson, 2014). Facilitator should help adults to see the value of the learning by linking it to quality of their lives or effectiveness of their performance (Knowles, Holton, & Swanson, 2014). Facilitator may also employ simulated experiences in which learners can see the gap between where they are and where they want to be (Knowles, Holton, & Swanson, 2014).
2. The learner's self-concept: As humans develop from childhood to adulthood, their self-perception changes from dependent to self-directing. They want to act according to their wills. Teacher as an authoritative figure conflicts with this self-concept. Facilitator should allow self-directing experiences for adults while learning (Knowles, Holton, & Swanson, 2014). SDL practices can be used for this purpose.
3. The role of the learner's experiences: Adults accumulate large pool of experiences. This can be utilized as a resource for learning (Knowles, Holton, & Swanson, 2014). Facilitator can tap into these resources via experiential techniques such as group discussions, case studies and peer-helping activities. Adults define themselves according to experiences they have. Neglecting experiences means neglecting adults as persons. This has detrimental effects for adult learning. Moreover, because of these experiences, adult learning groups are more heterogeneous compared to youth ones. More individualized learning techniques should be employed for adults (Knowles, Holton, & Swanson, 2014).
4. Readiness to learn: Adults move from one developmental stage to another. Learning experiences should meet those developmental stages. For example,



giving supervisor training to factory bench workers is not feasible until they master their work (Knowles, Holton, & Swanson, 2014).

5. Orientation to learning: Adults are life-centered, not subject-centered in their learning endeavors. They learn better when knowledge, skills and attitudes are presented in the context of application to real-life situations (Knowles, Holton, & Swanson, 2014). Curricula should be constructed around real-life cases.
6. Motivation: Adults are responsive to external motivators such as money and promotions but most potent motivators for adults are internal ones such as job satisfaction, quality of life and self-esteem (Knowles, Holton, & Swanson, 2014).

Pedagogy and andragogy represents two ends of a continuum. Instructor should evaluate which method is appropriate for the learners (Knowles, Holton, & Swanson, 2014). If learners have no clue about the subject, do not know the relationship with their real-life tasks, need to accomplish a performance with a body of knowledge or feel no internal need for the subject, pedagogical approach may be more appropriate. According to andragogy, after this starting point, learners should be elevated to more self-directing experiences and andragogical principles. For example, Instructor may support them to feel accepted, respected and safe. They may be exposed to need to know principle before the subject. They may have more choice and responsibility. They may participate in evaluation of their performance (Knowles, Holton, & Swanson, 2014).

In this study, novice learners were exposed to goal determination. This is in compliance with self-concept principle of andragogy. Learners had very important self-directing opportunity by determining their learning goals. But, as most of the participants were expected to have no prior knowledge about the subject, pedagogical principles may be more appropriate at the start.

## **2.7 State of the Literature**

Su and Reeve (2011) studied the effectiveness of training intervention programs which are designed to help people to support autonomy of others. They used a meta-analysis approach and examined 19 studies where some form of “supporting autonomy of others” training occurred. They classified interventions into 5 categories.

- Provide meaningful rationale. Participants are provided with explanation on how this activity serves personal goals and interests. This utility explanation is especially important to reach identified and integrated types of extrinsic motivation. After this intervention, participants self-reported greater autonomy, better engagement and more importance of the topic.
  - Acknowledge negative feelings. Participants are accepted, acknowledged and even welcomed for expressing their negative feelings and perspectives (“This is boring” or “This is silly”). Suppressing or criticizing participants’ feelings is a controlling type social context. Providing meaningful rationale may cause emotional tension because logical explanation is not enough for the current inclinations or feelings (Deci, Eghrari, Patrick, & Leone, 1994). By accepting negative feelings, it was meant that, this inconsistency is legitimate and does not block doing the activity. This intervention causes greater autonomy because it conveys respect for the person’s feelings. For example, in an untidy room, a mom provides child with the explanation “gather your toys because I may step one of them and cause break”. After this meaningful rationale, child may feel tension because tidying room is a boring task. Mom may accept this feeling as “I know, tidying room is boring”. After accepting negative feelings, child will feel greater autonomy by getting “your feeling is legitimate and does not block activity engagement” message.
- Use a non-controlling language. Participants are provided with non-pressuring communication and non-evaluative comments. For this, non-controlling language (instead of “have to”, “must” and “should”, use “may”) is used. Participants feel freedom instead of obligation.

- Offer choice. Participants are provided with choices during the activity. Those choices are explained and participants are encouraged to take action according to their inclinations.
- Nurture inner motivational resources. Activity is constructed according to participants' interests, psychological needs (autonomy, competence and relatedness), curiosity and challenge.

Moreover, Katz and Assor (2007) states means for increasing autonomy as minimizing pressure, acknowledging students' perspectives and feelings, providing a relevant rationale for the task, offering choice to participate in method, goal and evaluation of student's work, allow criticism and some expression of negative feelings.

In this study, autonomy support is "offering choice" in goals which is perfectly consistent with previous researchers' autonomy support methods. For this intervention to work, course goals were explained and participants were encouraged to take actions according to their personal interests and goals.

Liu et al. (2014) investigated how SDT needs satisfaction affects academic achievement. Self-regulated learning framework tries to explain good learning habits for better academic achievement. In this study, researchers tried to understand whether there is a correlation between self-regulated learning and satisfaction of SDT specified basic needs, namely competence, autonomy and relatedness. They have conducted motivated strategies for learning questionnaire (MSLQ) within 238 junior college students. According to their finding, there is a correlation between SDT needs and self-regulated learning which positively affects academic achievement. This finding supports SDT.

Stefanou, Perencevich, DiCintio and Turner (2004) specified that there are 3 categories of autonomy supportive teaching behaviors. These are organizational, procedural and cognitive type supportive behaviors. Procedural type supportive behaviors include ownership of form such as provide choice in classroom equipment

and materials, expressing ideas in different forms such as graphs, texts, videos etc. Organizational autonomy support includes ownership of learning environment by students. These teacher behaviors are related with the choice for the classroom management issues such as team members to work with, due dates for the assignments etc. Cognitive supportive behaviors include ownership of the learning by students such as provide opportunities like finding other ways for solution, receive informational feedback, formulate personal goals or realign task to correspond personal interests etc.

Stefanou et al. (2004) found that cognitive supportive behaviors are essential for autonomy while organizational and procedural types are not so effective. Cognitive type of support results in more deep-level thinking compared to organizational and procedural supportive behaviors. This finding is in compliance with SDT. Goal autonomy is a part of cognitive supportive behaviors according to study.

Furtak and Kunter (2012) investigated procedural and cognitive autonomy type supportive behaviors and their effects on motivation and learning. They conducted a 2x2 factorial design experiment in a small 7th grade science class. There were 51 participants. Duration was 2 days. They investigated both procedural and cognitive autonomy. There were 4 treatment groups with combined procedural and cognitive autonomy support. Conditions were; High procedural-low cognitive support, high procedural-high cognitive support, low procedural-low cognitive support and low procedural-high cognitive support. Groups were given pretest and posttest. They found that there was no effect of procedural autonomy on better learning. This complies with what Stefanou et al. (2004) has found.

But as a surprising result, there was higher learning in low cognitive autonomy-supportive conditions. This contradicts with SDT. In this research, students perceived low levels of autonomy in high cognitive autonomy-supportive conditions according to autonomy questionnaire. So it can be said that researchers could not construct an environment for higher perceived autonomy. Autonomy is not what teachers do in the classroom but what students feel at the end of intervention. This

may also be due to short duration. Students could not adjust to new style which is different from traditional instruction.

Kusurkar, Ten Cate, Vos, Westers and Croiset (2013) investigated whether autonomous motivation (which originates within an individual) can positively affect good study strategies. Motivation and academic performance relation was well established by prior research. This was done in medical field and researchers employed structural equation modeling in their analyses. Surveys were conducted with questionnaires. Their finding supports previous researches as motivation and academic performance are positively related through good study strategies and higher efforts for medical students. This affects academic performance (in terms of GPA) positively.

In summary, self-direction opportunities are a way for increasing autonomy. Participant determined goal selection is a form of this. Some of the research attributed positive effects of SDT on academic achievement to self-regulated learning and good study strategies. Moreover, best way to support autonomy is cognitive type which is moving responsibility of learning to students. On the other hand, some of the researches restrict benefits of autonomy to specific circumstances. As Katz and Assor (2007) specified, if choice does not serve student's competency and autonomy needs it is mostly useless. Similar finding was proposed by Pratt (1988) and Grow (1991). They stated that, if student has no competency in the subject and lack necessary commitment (for learning) and confidence (on their abilities) they will not be able to follow self-directed goals.

Our literature review shows that, goal selection type of autonomy was not investigated much. This can be due to, relatively persistent nature of course contents and curriculum in education settings. Moreover, technical training field needs more attention and was not covered much by studies. When motivation and outcomes thought, most of the studies are correlational type. Number of experimental research designs is very few on motivation and outcomes (Vallerand, Pelletier & Koestner, 2008). Mixed methods study in this subject and field will fill the gap in the literature.



## CHAPTER 3

### METHODOLOGY

Our research questions are the following;

1. Is there a difference between the gain scores of students with autonomy in learning goals and those without autonomy in learning goals in a technical training course?
2. What are the participants' perceptions pertaining to the learning environment and learning goal autonomy?

#### 3.1 Research Model Definition

A mixed methods research was conducted to examine goal autonomy and its effect on achievement. Qualitative and quantitative approaches provide different pictures and perspectives. Each has its limitations. Quantitative data allows generalization and provides general understanding of a problem, whereas qualitative data allows hearing individuals and provides detailed understanding of a problem. Combination of both methods provides a more complete understanding of the research problem (Clark & Creswell, 2011, p. 8). Mixed methods research is defined by Johnson, Onwuegbuzie and Turner (2007) as:

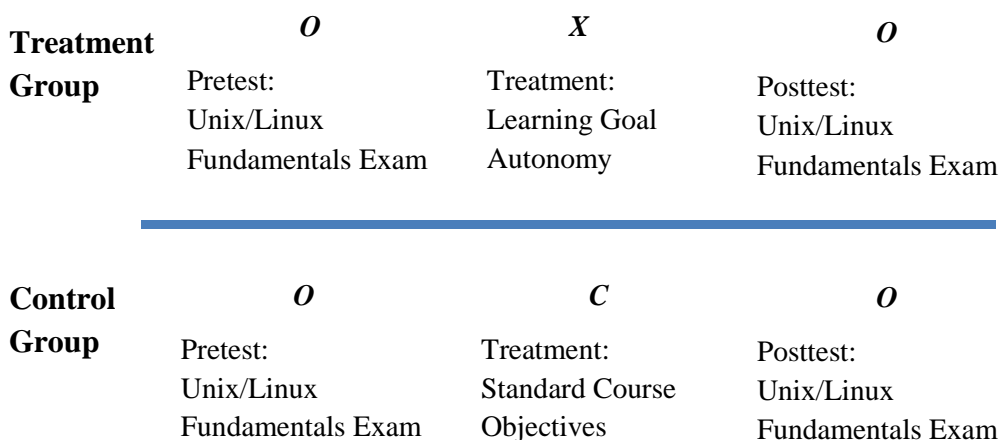
Mixed methods research is the type of research in which a researcher or a team of researchers combines elements of qualitative and quantitative research approaches (e.g., use of qualitative and quantitative viewpoints, data collection, analysis, inference techniques) for the purpose of breadth and depth of understanding and corroboration (p. 123).

Clark and Creswell (2011, p. 8) states several reasons for employing mixed methods research. In this research, there was a need to explain the study with a second

method. Understanding of research problem was possible by, first measuring if treatment has any significant effect on experimental group. A quasi-experimental study was conducted for this purpose. Then, understanding perceptions and perspectives of participants about treatment were necessary to explain or elaborate this finding. Follow-up interview were conducted to support this finding.

Mixed methods explanatory sequential design research was used as model. It includes quantitative study followed by qualitative study. Researcher uses first quantitative part to collect and analyze data. Qualitative part comes next to explain or elaborate on the quantitative part. The rationale for this design is that, quantitative data collection and analyses provide general understanding of relationships and trends. Qualitative data collection and analyses explains those statistical results by presenting participants’ perspectives in a more detailed manner. Qualitative part helps to explain mechanisms or reasons behind the relationships (Clark & Creswell, 2011, p. 104).

The first part of the study was an experimental study. Experiment is the scientific way of finding cause-and-effect relationships. Random sampling was not possible in this case. All participants were determined by company academy department. According to Fraenkel, Wallen and Hyun (2012, p. 275), quasi-experimental designs do not include random assignment. Experimental part design was a quasi-experimental pretest-posttest control group design (Fraenkel, Wallen, & Hyun, 2012, p.271). It is shown in figure 3.1.





### Figure 3.1 Quasi-Experimental Study Design for the First Part

There were two groups in two training sessions. Independent variable was autonomy in learning goals. This is depicted as treatment in the figure. It was known by research that, choice and opportunity for self-direction increase autonomy (Ryan & Deci, 2000). Autonomy positively affects motivation according to SDT (Ryan & Deci, 2000). Motivation directly affects learning and achievement (Ryan & Deci, 2000). Dependent variable was achievement. To measure achievement, pretests and posttests were used in each group. Pretest-Posttest achievement gains are necessary to measure dependent variable (achievement).

Fraenkel, Wallen and Hyun (2012), defines, internal validity as “Observed differences on the dependent variable are directly related to the independent variable, and not due to some other unintended variable” (p. 166). According to Fraenkel, Wallen and Hyun (2012), quasi-experimental pretest-posttest control group design has some internal validity threats. They labeled the following threats as “may possibly occur”; Subject characteristics, mortality, instrument decay, testing, maturation and regression. These threats need some control by the researcher. Threats, their implications for this study and measures to control were specified in the following paragraphs.

Subject characteristics which may affect treatment were collected through follow-up interview. For this purpose, participants’ university degree, gender, past experience with subject and age were evaluated. Findings were presented in interview analyses part.

Mortality was not a problem in this training. Researcher is an experienced internal trainer for this training course. From experience, it was seen that attendance was very high for past training courses.

Nature of the instrument or interpretation of it may be changed. This is known as instrument decay. For example, fatigue can happen for a researcher while scoring

student papers. Pretest and posttest instruments are multiple-choice tests. It is not open to multiple interpretations. Same tests were used for both control and experimental groups.

Testing is another threat for internal validity. Here, pretest can change posttest results. In an experimental design, only independent variable should be allowed to affect dependent variable. But pretest may trigger students to study pretest topics, cause them to focus on pretest questions and subjects. Course duration was 5 days. They may easily remember pretest questions. These may affect their posttest scores. To control this threat, following precautions were employed. Both control group and experimental group took pretest and posttest. If there was any testing effect, it was expected to be the same for both groups. Moreover, participants were informed about the pretest short after the start of the course. So they were not able to study prior to pretest. Pretest questions were not solved in the classroom. Lastly, pretest and posttest questions were different.

Maturation is about effect of passed time on change. In this study, training duration was 5 days long. It was not an issue.

Regression is especially important threat when high or low extreme score subjects are participated in the study. These participants tend to approach mean of the group during the study. Every class may include high and low extreme achievers. But this study was not focused on such participants. Participants were from company departments. They were selected according to job role needs. They were not selected because of being high or low achievers.

In the second part, a follow-up semi-structured interview was conducted through emails. Qualitative open-ended interviews are the most appropriate tool to explore participants' perceptions and perspectives through their own words (Kvale, 1996). Open-ended questions allow participants to express their experiences without the boundaries of researcher and past research findings (Creswell, 2012, p.218).

Trainer effect may be seen as a validity concern in the qualitative part of this study. Researcher was the instructor for the course. Participants may not be sincere in their responses as they were sending their replies to instructor as a researcher.

### **3.2 Participants**

Name of the training course was “Unix/Linux Fundamentals”. It was about using Unix/Linux servers as an end user effectively. It was a 5-days long training. Researcher is an internal trainer and SME (Subject Matter Expert) in a large scale communication company. Company academy department announces a course in 2-3 months intervals. Participants are selected by academy department according to demands from company business and technology units. Each class consists of maximum 16 students. But according to academy department arrangement, first course (control group) was taken by 12 participants and second course (experimental group) was taken by 13 participants. Although these numbers are small for an experimental design, they are acceptable in technical training field for a classroom.

Demographic survey questions were replied by %92 of control group and %92 of experimental group. But other participants' job and experience related information were easily collected from LinkedIn social network. LinkedIn focuses on professional information and presents a short form of CV. Because its sole aim is to share job related information to social network, LinkedIn is a reliable source for job related information. Today, many employers use LinkedIn to evaluate candidates for job positions. After LinkedIn searches, demographic survey reached %100 for both control and experimental groups. Average age for participants was 30.3 for control and 30.5 for experimental group. Control group was %100 (n=12) male. Experimental group was %15 (n=2) female and %85 (n=11) male. They were all Turkish.

Average job experience for control group was 5.9 years. It was 5.8 years for experimental group. The work experience in the current company was 3.6 years for

control group and 3.2 years for experimental group. Unix/Linux experience was 1.25 years for control group and 0.5 years for experimental group.

Both control group and experimental group participants were all engineers. Control group consisted of %25 computer engineers, %8 telecommunication engineers, %50 electrical and electronics engineers, %8 electronics and communication engineers and %8 electronics engineers. Experimental group consisted of %38 computer engineers, %38 electrical and electronics engineers, %8 electronics and communication engineers, %8 electronics engineers and %8 mathematics engineers.

Table 3.1 Demographics

Information Type	Control Group	Experimental Group
Participant Count	12 (12 male)	13 (11 male, 2 female)
Job Experience (years)	5.9	5.8
Unix/Linux Experience (years)	1.25	0.5
Current Company Experience (years)	3.6	3.2
Age (years)	30.3	30.5
Job Role	Engineer	Engineer

Participants were from company departments. Researcher had no impact on selection process. So, random sampling was not an option here. According to demographic survey, subject characteristics were minor problem here. Participants were graduates from engineering departments of universities. They were novice level users of Unix/Linux operating systems. Pretest scores were higher for control group. It is due to longer experience with the Unix/Linux systems.

In this case, random assignment of subjects was not possible. But pretest was used to understand how groups were equivalent. It is known that even in randomly assigned groups, if sample sizes are less than 30, researchers prefer to use pretest to

understand whether randomization was successful (Fraenkel, Wallen, & Hyun, 2012).

Course location was different for experimental and control groups. Academy department had several classrooms distributed in 2 cities. Experimental group's session realized later on a better conditioned (newer chairs, cozy rest room etc.) classroom. Except for the comfort, all other conditions (network, computers, and virtual machine setup in the lab) were similar.

### **3.3 Instruments**

#### Quantitative

To compare control and experimental groups, the effect of treatment must be determined. The way for this is to calculate gain scores. Gain score can be calculated by subtracting pretest from posttest score. In another way, pretest and posttest were used to measure dependent variable, namely achievement. To prepare pretest and posttest questions, first intended learning objectives of each unit were determined. There were 10 units in the course. For each unit, 2 most important learning goals were determined. For each learning goal, a question was prepared in pretest and posttest. At the end, each of pretest and posttest included 20 multiple choice questions. Control group took the tests according to their standard course objectives. Experimental group's test questions were personalized to their selected objectives if any.

Multiple choice questions were chosen, because, they are not vulnerable to instrument decay threat. Pretest and posttest questions were provided in appendix C.

Control group participants were not expected to share test questions with next (experimental group) participants. This was rather unlikely, as, tests had not any effect on course grade. Moreover, next participants were determined by academy

department later. That means second training course participants were unknown at the time of first training session.

Kuder-Richardson approach is the most preferred method for determining internal reliability of an instrument (Fraenkel, Wallen, & Hyun, 2012, p. 156). Especially KR20 does not require the assumption that all test items are in equal difficulty. So KR20 method was employed to determine pretest and posttest reliability.

Control group pretest KR20 coefficient was 0.90196, control group posttest KR20 coefficient was 0.80915, experimental group pretest KR20 coefficient was 0.7714 and experimental group posttest KR20 coefficient was 0.87816. According to Fraenkel, Wallen and Hyun (2012, p. 157) reliability coefficient 0.7 or higher is preferred. Reliability scores were higher than 0.70.

The following table of specifications shows course unit numbers, learning objectives and Bloom’s Taxonomy. PreQ represents pretest questions and postQ represents posttest questions. It shows the relation between learning objectives, Bloom’s Taxonomy and pretest/posttest questions.

Table 3.2 Table of Specifications

Unit No	Learning Objective	Bloom’s Taxonomy					
		K	C	App	A	S	Eval
1	Connect remote Unix/Linux systems via CLI/GUI			PreQ2			
1	Use basic commands	PreQ1,					
1	Transfer files between Unix/Linux system and windows PC			PostQ2			
2	Distinguish enterprise	PreQ3					

	needs		
2	Explain Unix flavors and Linux distributions	PreQ4, PostQ4	
2	Identify the operating system information		PostQ3
3	Discover Windows and Linux file systems		
3	Do file/directory operations		PreQ5-6 PostQ5-6
4	Identify the problems related with permissions		
4	Assign permissions for files/directories		PreQ7-8 PostQ7-8
5	Use the features of shell		PreQ9 PostQ9
5	Redirect application/file IO		PreQ10 PostQ10
6	Edit a file	PreQ11 PostQ11	
6	Solve character set problems		PreQ12 PostQ12
7	Process files/directories in a smart way		PreQ13-14 PostQ13-14
8	Distinguish job, process and daemon concepts		
8	List, kill and start processes		PreQ15 PostQ15
8	Evaluate the utilization of system resources		PreQ16 PostQ16
9	Create, list		PreQ17

	contents and extract an archive		PostQ18
9	Compress and decompress an archive		PreQ18 PostQ17
10	Write scripts		PreQ19- 20 PostQ19
10	Deploy scripts as scheduled tasks	PostQ20	

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### Qualitative

In this study, semi-structured questionnaire was used to understand participants' perceptions and perspectives on learning goal autonomy.

Arksey and Knight (1999) defined semi-structured interviews as “main questions and script are fixed but interviewers are able to improvise follow-up questions and to explore meanings and areas of interest that emerge” (p. 7).

Interview schedule consisted of open-ended questions with no options. Whenever required, interviewer used unscheduled probes to investigate phenomenon more deeply.

First question was about demographics and subject characteristics. Demographics are important to understand sample space. Subject characteristics may become a validity threat for quantitative research. All characteristics which may affect dependent variable were collected. These are age, education level, job experience, subject experience and gender.

Second and third questions were asked to identify motivation type (intrinsic or extrinsic). SDT asserts that feeling autonomy causes increase in intrinsic motivation and better types of extrinsic motivation. Offering choice in goals is a way of



autonomy (Su & Reeve, 2011). For research questions, it was important to understand whether learning goal autonomy causes different behaviors according to motivation type.

Fourth question directly addresses thoughts and feelings perceived by participants when they heard learning goal autonomy in the class. This question directly related with the research questions. First impressions and following feelings and thoughts were asked to reveal participants perspectives

Fifth question asked whether participants understood how course objectives serve to their business and work life. Before starting study, researcher contacted with Edward L. Deci who is one of the founder of Self-Determination Theory. He suggested explanation of course goals at the very beginning of the course. Moreover, Katz and Assor (2007) specified that, if a person realizes that, he is not competent in the selection process, he tends to select default ones or decide not to choose. So understanding course objectives is crucial to make a choice and feel autonomy. This understanding level was investigated in this question.

Sixth question concentrated on whether participants really felt freedom to determine the topics. This also checks after-first impression feelings and thoughts.

Seventh question asked whether self-determination of goals increased the motivation to learn. According to SDT, there should be positive effect of autonomy on motivation. This question addresses the motivational consequence of learning goal autonomy.

Eighth question asked participants for any enhancements or recommendations for learning goal autonomy to work. This question reveals any non-functioning side of learning goal autonomy. Participants were free to point incomplete sides of learning goal autonomy implemented in the course.

SDT asserts that autonomy supportive social contexts facilitate self-determined motivation. Climate questionnaires were used in several researches to measure how environment is autonomy supportive (Black & Deci, 2000). Several types of climate questionnaires were prepared on work, health care, sport and learning. Lack of Turkish version of learning climate questionnaire (LCQ) prevented us to use this instrument. Instead, last two questions (Ninth and tenth questions) were formed according to LCQ questions. These questions addressed instructor autonomy support. They were about whether instructor understood participants and presented choices and alternatives during the course. Goal autonomy and choice questions were important for the research questions. This is crucial as without experiencing autonomy support, research is useless.

As a result, interview was constructed to answer research questions. Questions were related to attendance reason for the course, whether learners have prior intrinsic motivation, their thoughts and feelings when they saw that they had goal autonomy, whether they understood how goals serve to their personal/work life, whether they felt any increase in motivation and their recommendations for better working goal autonomy method. We also asked autonomy support of the instructor.

Reliable instrument refers to an instrument which produces the same consistent result independent of who is conducting the study (Tracy, 2012). Reliability is hard to achieve in qualitative interview studies (Arksey & Knight, 1999). Because open-ended questions are open to different interpretations. Tracy (2012) also stated that, reliability is a good criterion for quantitative research, but it is not the case for qualitative research. Qualitative research generally is done with a single analysis in specific time and context (participants, physical environment, conditions etc.). It is very difficult to construct the same context.

Arksey and Knight (1999) states that, “reliability is mainly about minimizing the interviewer bias” (p. 53). Findings should not be the result of interviewer interpretation and product of the instrument. In this study, interview questions were seen and revised by two subject field experts to provide a reliable instrument.

Moreover, all coding and categorizing of the analysis was done by a peer independently. Later, researcher and peer researcher compared and combined their findings.

Interview questions were the same for all participants. This is due to online nature of the interview through e-mails. This prevented different explanations for different participants which diminishes the reliability of the study.

Validity is about actually investigating what we claim to investigate (Arksey & Knight, 1999). Validity is a concern about the specific inferences we get from the use of instrument not the instrument itself (Fraenkel, Wallen, & Hyun, 2012). These inferences must be meaningful, correct, useful and appropriate for what we try to measure.

According to Arksey and Knight (1999), validity is enhanced by:

- Interviewing techniques that build rapport between interviewer and interviewee, supporting openness and trust for participants to express their perspectives freely. In this study, researcher was instructor for the course. Good level of rapport was established after 5-days. Researcher tried to establish openness and trust via informed consent form and in-class experience.
- Questions taken from literature and pilot work. In this study, a pilot use of instrument was conducted in two same type previous courses. Question ambiguities eliminated and their relation to research problems was enhanced. Well-tested Learning Climate Questionnaire (LCQ) was used to construct additional questions.
- Questions covering all key aspects of the research question. In this study, all interview questions were firmly tied to research questions and revised by one field expert in this study.

- Prompts that clarify vague points in answers. In this study, following spontaneous probe questions were asked to clarify, expand participant perspectives.
- Long enough interviews. In this study, e-mail interviews were employed. One of the positive sides of online interviews is that it allows respondents to think on answers.

Interview questions are included in appendix B.

### **3.4 Procedures**

The data was collected through Unix/Linux fundamentals course. It is a 5-days long IT technical training course. One can find many examples of this course in IT training field. Enterprises run lots of workloads on Unix/Linux operating systems. So employees must have competency to work with such types of servers. The description of the course and its learning objectives were explained in appendix D.

Two course sessions were held in company academy classrooms. Experimental group consisted of 13 and control group consisted of 12 participants from company IT departments. Control and experimental groups took the same training course except the autonomous or controlling course objectives. Control group received training with standard course objectives. Their course objectives were presented to them in the beginning of the course.

Experimental group received control group's complete objectives in the beginning of the course. To increase autonomy, some course units were divided to provide new alternative units. Moreover, learners were provided with possible interesting new units. Learners were also free to select any topic in this subject. At the beginning of the course, instructor explained standard, alternative and new course objectives and discussed with students how these objectives were relevant to their current job roles. Participants were expected to evaluate the course objectives and select appropriate

ones. The important point here was to give self-direction opportunities to participants and increase perceived autonomy.

Instructor provided some resources (PDF documents, Web addresses etc.) for all course units. Instructor also announced himself as a resource. He was available for individualized questions before and after the course, for 1 hour, each day. Participants with different objectives were invited to ask questions and learn in these hours. These hours were not expected to affect internal validity. Individualized course content needs to be managed as close as to normal course flow. Pretest was conducted after 1 hour introduction to course. For 5 days, standard course content was explained in control group.

Experimental group were left to choose any content. Instructor also asked for direction whenever alternative content was feasible to explain. If there were a consensus in the class, instructor changed his route to new content. Instructor was also available in the classroom 1 hour before course started and 1 hour later after course ended.

After course finished, a posttest was conducted. Normally, standard Unix/Linux Fundamentals course did not include any summative evaluation. All of the participants, who participate regularly in class sessions, were accepted as successful. Pretest and posttest evaluations were conducted for the sake of the research. At the beginning of the course, it was announced that pretest and posttest scores would not be related with student course success.

The following week of the course, semi-structured and open-ended interview questions were sent to experimental group participants via e-mail. Interviews were conducted in Turkish. Whenever needed, spontaneous probe questions were used to get detailed answers to questions. This e-mail was also including informed consent form. Participants were also informed about this interview questions at the end of the course. As explained in the consent form, participation was voluntary.

Participants replied with e-mail. All answers were aggregated in a document. Participants were reminded via e-mail about the interviews and probe questions from time to time.

Thus, pretest and posttest questions were used to collect quantitative data. Interview questions were used to collect qualitative data. The interview was also contained demographic questions such as age, graduate level and past experience with the subject. These demographic questions were also sent to control group participants to check internal validity concerns.

The whole procedure for the research was presented in the following table.

Table 3.3 Time Frame for Research

Date	Research Progress
June 2014	Control group pretest was conducted
June 2014	Control group course was implemented
June 2014	Control group posttest was conducted
August 2014	Pilot study 1 of pretest/posttest and follow-up interviews were conducted in a new course. Corrections were made
January 2014	Pilot study 2 of pretest/posttest and follow-up interviews were conducted in a new course. Corrections were made
April 2015	Experimental group pretest was conducted
April 2015	Experimental group course was implemented
April 2015	Experimental group posttest was conducted
April 2015	Experimental group follow-up interviews were collected
April 2015	Control group follow-up demographics were collected
April 2015	Experimental group follow-up interviews probe questions were asked and answers were collected

### **3.5 Quantitative Analyses**

Pretest and posttest descriptive statistics were provided. The difference between pretest scores was explained according to demographic information gathered via interview questions.

Pretest scores of control and experimental groups were compared with independent-samples t-test. This was used to understand whether there was a statistically significant difference between 2 groups in terms of field knowledge at the beginning of the course.

In this study, gain score difference was important for us to understand achievement. Each subject's gain score was calculated by taking difference of pretest and posttest scores. Mean of these gain scores was calculated. Because there are only 2 groups with mean gain scores, independent-samples t-test was used to estimate the result in population.

### **3.6 Qualitative Analyses**

Interview was conducted for only experimental group, because this was the group who experienced the effect of learning goal autonomy. %92 (n=12) of the experimental group participants responded to open-ended interview questions.

Spontaneous questions were posed according to participant answers. After collecting all answers, responses were aggregated in a document.

Answers were read by researcher several times to see repeating themes. Kvale and Brinkmann (2009, p. 201) states that coding and categorizing are early steps for interview analysis focusing on meaning. Coding is labeling a text segment with one or more keywords. Categorizing is more systematic conceptualization of a statement. It allows quantification of statements. Generally, one or more codes are grouped under one category. All paragraphs were replaced with an equivalent short statement

by the researcher. This code represented the main idea for the paragraph. Questions and codes were prepared as a table. Researcher scanned this table and extracted categories by grouping similar codes. Several scans were done to revise codes and categories.

These categories were prepared as a table to reflect a birds-eye view of the sample, for each question. These tables showed frequencies and categories for answers. This allowed researcher to arrive conclusions.

To avoid researcher bias, a peer reviewed the responses. Coding and extracting categories steps were done independently by the peer reviewer. These findings were compared and combined with researcher findings.

### **3.7 Limitation of the Study**

Sample sizes were small, 12 participants in control group and 13 participants in experimental group accordingly. Fraenkel, Wallen and Hyun (2012, p. 103) recommends at least 30 individuals per group in experimental studies, although as low as 15 may be defended for tightly controlled environments. For qualitative studies, sample sizes may be between 1 and 20. In this case, reaching 30 individuals per group was not possible, as classrooms could include at most 15 persons which is a standard for IT training courses. It would be better to do this research with as many classrooms as possible.

Sampling method was not random. Participants were selected by company academy department. These are because of the academy department's regulations. Fraenkel, Wallen and Hyun (2012) suggests that samples must be described (demographics) as much as possible (p. 104). Demographics data were collected through interview questions in this study. Moreover, pretests were employed. Pretest results showed us how similar are the groups.



Training location was different for control and experimental groups. This is due to company academy department's classroom assignment.

### **3.8 Delimitation of the Study**

Research was conducted in a training environment. Findings may not be applicable to K12 settings.



## CHAPTER 4

### FINDINGS

#### 4.1 Quantitative Results

All participants in control group (n=12) and experimental group (n=13) took the pretest. 12 of the 13 participants of the experimental group answered posttest. 1 participant did not take the posttest because of illness. 12 of the 12 participants answered the posttest questions in the control group. Thus, 12 participants' scores were evaluated in each group at the end.

Control group's pretest mean was 22.08 (SD=23.88) and posttest mean was 79.6 (SD=17.74). Experimental group's pretest mean was 16.25 (SD=15.83) and posttest mean was 72.6 (SD=16.85). Control group's pretest mean score was higher than experimental group's mean score. This was because of more prior experience of control group on the subject. Unix/Linux experience was 1.25 (SD=2.18) years for control group and 0.5 (SD=0.78) years for experimental group. This reflects the reason why pretest scores were higher for control group.

Independent samples t-test was conducted to see statistical significance between pretest scores.

The following assumptions of t-test were checked:

- Independence: Observations (scores) must be independent. There was no relation between the samples of each group. They were all different company employees. Moreover, there was no relationship between observations within the sample.

- Normality: Shapiro-Wilk test which is appropriate normality test with less than 50 subjects was used. Test significance was found as 0.01 (control) and 0.04 (experimental). These were less than 0.05 (p value). So null hypothesis (normality assumed) was not hold here.
- Homogeneity of variance: Variances must be approximately equal between the two groups. According to Levene's test for equality of variances, test significance was found as 0.24. This was more than p value (0.05). So this assumption was hold. Equal variances were assumed. For this reason, df was taken as 22.

Table 4.1 Comparison of Pretest Score Difference

	Group	<i>N</i>	<i>M</i>	<i>SD</i>	<i>SEM</i>	<i>t</i>	<i>df</i>	<i>p</i>
Pretest	Control	12	22.08	23.88	6.89	0.71	22	0.49
	Experimental	12	16.25	15.83	4.57			

Statistical analysis indicated that there was no statistically significant difference between pretest scores of control ( $M=22.08$ ,  $SD=23.88$ ) and experimental groups ( $M=16.25$ ,  $SD=15.83$ );  $t(22)=0.71$ ,  $p>0.05$ . This result suggests that both groups had similar level of competence at the beginning of the training.

The effect of treatment was measured by using independent samples t-test. Because there are only 2 groups with mean gain scores, independent-samples t-test was used to estimate the result in population.

For control group, mean gain ( $M$ ) was 57.5 with standard deviation 24.24. For experimental group mean gain ( $M$ ) was 56.38 with standard deviation 12.09. t-test needs some assumptions to be held.

Assumptions of t test were checked for validity reasons according to Gravetter and Wallnau (2013, p. 300).

- Independence: Observations (scores) must be independent. There was no relation between the samples of each group. They were all different company

employees. Moreover, there was no relationship between observations within the sample.

- Normality: Shapiro-Wilk test which is appropriate normality test with less than 50 subjects was used. Test significance was found as 0.382 (control) and 0.579 (experimental). These are bigger than 0.05 (p value). So null hypothesis (normality assumed) was accepted here.
- Homogeneity of variance: Variances must be approximately equal between the two groups. According to Levene's test for equality of variances, test significance was found as 0.03. This was less than p value (0.05). So this assumption was not hold. Equal variances were not assumed. For this reason, df was taken as 16.152 instead of 22.

Statistical analysis indicates that there is no statistically significant difference between achievement scores of instructor determined goals training (M=57.5, SD=24.24) and goal autonomy provided training (M=56.38, SD=12.09) conditions;  $t(16)=0.144$ ,  $p>0.05$ . This result suggests that providing goal autonomy does not affect achievement in an introductory course training setting.

Table 4.2 Comparison of Achievement Gain Score Difference

	Group	<i>N</i>	<i>M</i>	<i>SD</i>	<i>SEM</i>	<i>t</i>	<i>df</i>	<i>p</i>
Achievement	Control	12	57.5	24.24	7	0.14	16.15	0.89
	Experimental	12	56.36	12.09	3.45			

## 4.2 Qualitative Results

Interview questions were replied by %92 (n=12) of the experimental group participants. Participation to follow-up interview was voluntary and one participant preferred not to participate. Percentage calculations were done according to respondents (n=12) not all participants (n=13).

Question 1 was about demographics of the participants. This data was used for subject characteristics validity concern.

Participants were asked for the reason for taking “Unix/Linux Fundamentals” course in question 2. Some of the participants were specified more than one category. The reason was explained as a sole workplace requirement only by the %33 (n=4) of the participants. For example, one participant replied as “We have a Unix based server. We have been doing file upload, back up and copy. I thought that, I need to learn Unix/Linux systems at introductory level (Student 4)”.

%33 (n=4) of the participants were taking this course for professional purposes, developing themselves as qualified engineers. One participant declared this as “I knew that, this training will contribute my profession on both technical and professional culture dimensions (Student 6)”.

%17 (n=2) of the participants declared reason as both professional development and work place requirement at the same time. One participant said that “We have been using Unix/Linux devices. Moreover, I wanted to advance in security field. Because of these, it was a necessity for me to learn Unix/Linux systems (Student 1)”.

%17 (n=2) of the participants declared understanding Unix/Linux systems in a shallow way as a reason for taking this course. One participant declared this reason as “I wanted to get introductory information about Linux systems. If, somehow, I coincide with Linux systems in the future, I wanted to know how these systems like. So, I did not have a motivation to grasp everything explained during the course (Student 12)”. They had just simple wonder for general understanding of Unix/Linux systems. This is similar to professional reason. But it was seen that, desire for shallow understanding of content caused this group to be disconnected from the course flow. Their target for understanding was so low that, after introduction to a unit, this group ignored rest of the topic. The course was containing 10 units. This group had learned only basic information for each unit. So they were specified under different category.

Table 4.3 Reason for Attending Course

<b>F</b>	<b>Categories</b>
4	Professional Development
4	Work requirement
2	Both Work Requirement and Professional Development
2	Shallow Understanding

Participants were asked whether they had intrinsic motivation for the subject in question 3. According to Ryan and Deci (2000), one approach to measure intrinsic motivation is self-reports of enjoyment and interest for the activity. Intrinsic motivation was self-declared by %33 (n=4) of the participants. But, only %8 (n=1) of participants were regularly using Unix/Linux systems because of intrinsic motivation. This participant declared, “I have a wonder to learn Unix/Linux systems. I was coding small applications in my installed environment (Student 8)”. Other participants with intrinsic motivation had some form of wonder, desire and interest for the subject. For example, one of them declared this as “Because of my job responsibilities, I could not advance in Unix/Linux systems. But I have always wondered and had desire for this. For this reason, when this opportunity came to existence, I wanted to advance myself and listen to Unix/Linux systems from a professional voice in this field (Student 10)”. They were not actively engaged with Unix/Linux systems. According to Deci, Vallerand, Pelletier and Ryan (1991) engagement with the activity is required for intrinsic motivation. Otherwise, it turns out to be passive interest and wonder.

Rest of the participants (n=8, %67) had extrinsic motivation. One Participant with extrinsic motivation declared "I remember installing Linux when I was a student in university. After university, I did not study these systems more except job responsibilities (Student 9)".

Table 4.4 Motivation Type

<b>F</b>	<b>Categories</b>
8	Extrinsic Motivation
3	Intrinsic Motivation ( with passive

In question 4, Participants were asked “What did you feel and think when you heard that learning goals would be determined by you”. They declared mixed feelings. After their first impression, they also declared some accompanying feelings. All of the declared feelings were used for categorizing. %42 (n=5) of the participants astonished and surprised as a first reaction. One participant declared this as “I have astonished when I first heard this, as I experienced such a thing for the first time. In the past, I took different technical trainings. But this was the first time; a trainer offered such a thing (Student 5)”.

After first reaction, %58 (n=7) of the participants declared positive thoughts and feelings and found this intervention learning supportive. They declared positive effects, such as “I have felt involved (Student 2).”, “I have seen this as an opportunity to get support for interesting subjects (Student 1)”, “I have asked my questions without hesitation (Student 6)”, “I have thought this opportunity to choose as boosting motivation. People usually are more eager about the stuff they direct (Student 11)”. The only one with intrinsic motivation with ongoing activity and prior experience focused on previously interested projects. This participant asked questions during the training on projects/topics he worked on before.

%33 (n=4) of participants specified that this process could give benefit for those with prior knowledge or experience about the subject. One declared this as “Participants must have at least introductory level knowledge so that they can determine the course content (Student 3)”. One participant with a shallow understanding intent declared nothing felt about the process. He did not expect much from the training. He had no aim at the beginning of the course. This was reflected in the learning goal autonomy process. He also specified that this may give benefit for the ones who knows what to do with Unix/Linux systems. One participant declared that he could not determine any target. This is in compliance with prior knowledge condition. This participant declared the result while previous two participants declared the cause.



Lastly, one participant declared that because he did not feel competent in selection process, he left this process to experienced trainer.

%25 of the (n=3) participants worried about the process, because individual and group goals can easily conflict with each other. One participant specified this as “I worried when I heard this opportunity, because majority of the participants from the same company department might shape the learning contents according to their inclinations. I wanted to learn important topics. If time permits, choosing from alternative topics might be OK (student 5)”. Later, these participants noticed that goals were individualized and support would be available for this. One participant declared this as, “Later, when I understand that self-determined goals would be individual, my wonder increased about the course. As individual goals, I determined preparation of Linux environment and installation of my desired applications (Student 8)”

Table 4.5 First Reactions (Feelings/Thoughts) about Goal Autonomy

<b>F</b>	<b>Categories</b>
7	Found Learning Supportive
5	Astonished/surprised
4	Introductory level/prior knowledge required
3	Worried (class/personal goal conflict)

Participants were asked whether going through learning objectives at the beginning of the course helped them to understand goals. Learning objectives were explained at the very beginning of the course. Without understanding how goals serve participants’ values and interests, as Katz and Assor (2007) specified, alternatives were picking not choosing. All of the respondents answered yes to this question. One participant answered this as “It was certainly good to see the big picture. We saw, what we can learn and if we want, we can change the content flow and see which extra contents we can study (Student 5)”. Three respondents (with previous experience with Unix/Linux systems) specified that, without prior experience, these plain explanations were not enough to choose topics. One of them said, “If a

participant has no prior background on the subject, it is not possible to determine learning goals. At least, it will not be a healthy selection of topics (student 3)”

Table 4.6 Understanding How Goals Serve Professional Job Requirements

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<b>F</b>	<b>Categories</b>
9	Understood
3	Prior knowledge was required to understand

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It was asked whether they really felt freedom to determine the topics in question 6. %75 (n=9) of the respondents declared that they perceived determination freedom. %25 (n=3) of the respondents did not feel this freedom. They specified causes as “I had no goal, just to have a shallow (broad) understanding of the subject (Student 12)”, “I did not feel this freedom as no request (about any new topic) came from the class (Student 10)” and “I had no previous background in the subject matter (Student 9)”. One participant declared that “I really felt freedom for determination of goals as I already had introductory knowledge about the course/content (Student 3)”. He insisted on importance of introductory level knowledge for perceiving freedom for goal selection.

Table 4.7 Was Freedom to Choose Topics Perceived by Participants

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<b>F</b>	<b>Categories</b>
9	Yes
3	No

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In question 7, it was asked whether self-determination of goals increased the motivation to learn. At first, %67 (n=8) of the respondents declared that motivation increased. Participants declared a sense of ownership, curiosity with answers like “When students determine the goals, course becomes student's course. Otherwise, especially if student does not pay for the course, course becomes trainer's or company's course (Student 3)”, “Yes... The most important reason is that, I felt as I was the only one in the class; I was taking training special to me. As a result, it caused me to feel that I should leave the class with maximum efficiency (Student 5)”

and “Determining learning goals certainly increases motivation. Firstly, determining goals gives a sense of ownership. It says “Look, you had such a curiosity, now you have an opportunity to learn and do. Make the best of it and learn” (Student 8)”.

%33 (n=4) declared that motivation did not change. They answered reasons such as lack of knowledge and encountering for the first time with the statements “to tell the truth, it did not affect me much. Because I encountered with such an offer for the first time, I can say that it did not affect my motivation (Student 4)”, “Although It was a condition I've never encountered before, it did not increase my motivation. I could not decide what I should choose (student 12)”.

Table 4.8 Did Freedom to Choose Topics Increase Motivation

<b>F</b>	<b>Categories</b>
8	Yes
4	No

Only %25 (n=3) of the participants determined goals. One participant determined already existing unit in the course. But, he did this consciously. Second participant determined new topics in second day of the course. He continuously asked questions in extra hours of the training. Third participants asked specific questions about interested topics. The common denominator for these participants was that, they had prior knowledge about the subject.

As an exploratory question, it was asked, “Why didn’t you choose any new topic for yourselves?” to all participants. (%33, n=4) declared their lack of knowledge and doing only routine tasks about the subject. They declared “in routine work, it is normal that a person cannot determine extra goals for himself (Student 4)” and “The most important reason for not determining new goals was that nearly all of the participants were lacking information about Linux. If we had known up to a certain level, then the new targets could be identified easily (Student 5)”. %42 (n=5) of the participants did not answer this question.

In question 8, it was asked “How this learning goal determination can work better? Do you have any recommendations?”. %25 (n=3) of the participants recommended goal autonomy only for experienced participants. One participant recommended goal determination in the middle of the course. Participants would have necessary background for the subject at that time.

%17 (n=2) of the participants declared adjustments at the very beginning of the course. They advised arriving consensus at the beginning of the course. One said “Trainer can conduct a poll before the training. All topics are passed through but the most requested topics are given a little more weight (Student 11).”

%17 (n=2) of the participants declared playing with class properties such as homogeneity of participants. One said “Homogeneous distribution of the classes is important, I think (Student 9)”. One said that goal autonomy is more appropriate for one-to-one. He expressed this as “Learning objectives may vary from person to person. A person may be curious and the other may not for the same topic. This may vary according to the work they do. So, more than classroom instruction, this method can be followed individually. The headlines and their brief content of the learning objectives of the class may be presented. Later a mini-survey may be conducted. The subjects requested by more participants can be studied in a classroom environment (student 10)”

%17 (n=2) of the participants specified before the training activities. In this case, trainer can explain topics with an email to participants. Then, he requests participants to come up with individualized topics in their minds. One said that “Topics may be sent to participants before the training. Trainer may request one or two hours studying on these topics before arriving at classroom (Student 8)”.

%8 (n=1) of the participants specified that, labs can be prepared according to participants work roles. For example, if participant works for security department, labs can be provided on this track.

Two participants did not answer this question.

Table 4.9 How Learning Goal Determination can Work Better

<b>F</b>	<b>Categories</b>
3	Having introductory knowledge
2	Consensus on topics at the beginning of the training
2	Class properties such as homogeneity and grouping individuals with similar goals
2	Before the training activities (such as describing topics before the training and requesting individualized topics)
2	Not answered
1	Prepared environment for growth (such as labs)

Questions 9 and 10 were extracted from LCQ (Learning Climate Questionnaire) to measure autonomy support. It was asked “Has trainer understood you? Has he tried to understand what you feel/think before answering your question?” All of the respondents have given positive answer to this question. It was asked whether trainer has provided participants with choice and selection. Again all of the respondents specified positive answers on this. So, it was concluded that autonomy support was adequate in the class and perceived well by participants.



## CHAPTER 5

### CONCLUSION AND DISCUSSION

#### 5.1 Discussion

SDT is mainly about effect of social context on motivation. It discriminates social contexts as autonomy-supportive or controlling. Autonomy-supportive contexts cause better types of extrinsic motivation and enhance intrinsic motivation (Deci & Ryan, 2002; Ryan & Deci, 2000). Climate questionnaires were developed as scales to measure the degree of autonomy-support for a social context. The follow-up interview included 2 questions from learning climate questionnaire. According to responses, autonomy support was well perceived by the participants in the experimental group.

Nevertheless, t-test statistics on achievement showed that there is no statistically significant difference between goal autonomy provided class and instructor determined goals class. This needs an explanation.

The course was an introductory course targeted novice IT users. As a result of this, most of the participants were in novice level. They were not competent to select goals. According to Katz and Assor (2007), this makes goal autonomy useless for novice participants. Explanation of course content and how those content contribute to personal and professional goals and interests of the participants were not enough. This can be seen from question 5 in interview. It was asked whether explanation of course topics identified how those topics serve personal or professional goals. %75 of respondents answered as yes and %25 pointed importance of prior knowledge. But only %25 of the respondents determined goals consciously. These are the ones with prior knowledge.

Besides providing straight explanations of topics, freedom to choose goals, providing alternative topics and additional resources were not enough for goal autonomy. Because novice participants lack field knowledge, they cannot evaluate course content and decide according to their needs and interests. This kind of autonomy is more appropriate for intermediate participants. If participants have intrinsic motivation besides field knowledge, they will get the maximum benefit from goal autonomy.

Readiness for SDL is another concept for explaining this tendency of novice users. Pratt (1988) describes these learners as needing direction and Grow (1991) describes these learners as dependent learners. They are dependent because they lack required knowledge and skills or they lack necessary confidence for their abilities (Grow, 1991). Instead of choice, this type of learners need clear directions and specific guidance with high task orientations.

Another important concept in readiness for SDL is emotional support. Direction is one dimension for readiness for SDL. Other dimension is emotional support. Learners may need to get support on confidence on their ability to learn and commitment or valuing learning objectives.

This shows that SDT's claim about goal autonomy and its effect on performance and learning is restricted by learner level. Novice learners need direction to achieve competence. Moreover, emotional support is required for commitment and confidence. After these prerequisites, learners will be closer for goal autonomy.

## **5.2 Conclusion**

It was seen that, if there is no prior knowledge about the subject, alternatives and goal autonomy are useless. According to Katz and Assor (2007), participants were not competent to direct training in this case. Plain explanations of learning goals,



providing alternatives were not enough. Participants preferred to accept default content.

Self-determination of learning goals perceived positively, but lack of prior knowledge on subject prevented participants to make choices. %75 (n=8) of the respondents touched this in one of their follow-up interview answers.

So goal autonomy was accepted as a nice offer. But it was not experienced in a real manner by the novice participants. This kind of autonomy is more appropriate for intermediate participants. These participants were able to evaluate learning goals and determine goals according to their interests and needs.

If participants had intrinsic motivation with prior experience/knowledge, they chose different topics than the standard course content. Only one participant had intrinsic motivation. This participant invested more time and got benefit from extra resources. He specified extra two topics to study as an addendum to course content. He asked questions in extra course hours. This was the best case where learning goal autonomy gave benefit. This participant continued to develop his expertise after the course finished. He asked questions to trainer after the course by emails.

Some of the participants worried about following individualized goals in a classroom context (Interview question 4). This may easily cause chaos. One can desire a topic which is not found interesting by other participants. This showed that, learning goal autonomy might be difficult in classroom context. Individual goals were difficult to follow in classroom group. So, it was important to have before and after-course extra hours for individualized topics. It was also important to emphasize this extra hours. Participants expected learning to occur only in classroom hours.

This study showed that well established findings from Self-Directed Learning should be integrated to Self-Determination Theory. Readiness for SDL is one of the topics that should be integrated.

SDT states autonomy as a basic psychological need and posits autonomy as causing better forms of motivation always. Readiness for SDL states that, dependent learners cannot utilize autonomy. Dependent learners need direction instead of autonomy. This study showed that autonomy for novice users did not affect achievement. This finding is in compliance with what readiness for SDL states.

The reason for attending course revealed that only half of the participants were in a workplace need to use Unix/Linux systems. Other half was in the class because of professional development desire. This group would not be able to transfer training outputs to workplace. As workplace support would be non-existent for transfer (Baldwin and Ford, 1988). This finding is parallel with what Villachica and Stepich (2010) says. According to Villachica and Stepich (2010), alignment between business needs and trainings is very crucial. Lack of alignment causes ineffective trainings. Philips and Philips (2002) declared lack of alignment as number one reason for why trainings fail.

One of the basic questions asked by this study was “what will happen if we free students to follow their own goals in a subject matter”. As Grow (1991) and Pratt (1988) pointed out, dependent learners cannot find their way and progress to a self-directed goal. “Unix/Linux Fundamentals” course is an introductory course. Mean score for pretest was 16.25 (SD=15.83). Participants can be accepted as novices in this subject matter.

As a solution, as some of the participants pointed that learning goals autonomy may be more meaningful in the middle of the training. As participants get competent in the subject, goal autonomy becomes possible. Another application of goal autonomy may be possible on participants with prior experience. These participants can make meaningful choices and this will increase motivation.

It was seen that intrinsic motivation (goal content) in an autonomous goal context yielded best performance. This finding was in compliance with the prior research.

Participants with intrinsic motivation got higher posttest scores (83.5) compared to the class average ( $M=72.6$ ,  $SD=16.85$ ).

Learning goal autonomy is especially useless for participants who expect only broad understanding of the subject. Although they might get benefit from goal autonomy, they did not use this kind of autonomy. One possible explanation may be prejudgment or restrictive expectations from the course. This might prevented them to get goal autonomy benefits. For these participants, restrictive course name may be converted to a more general name. For example, instead of “Unix/Linux fundamentals”, one can use “IT fundamentals”. This may cause participants to broaden their expectations from the course.

### **5.3 Implications for Practice**

Alignment of business and training is a big concern. Most of the time trainings are implemented for different reasons (trends, popularity, desires etc.) than business goals (Philips & Philips, 2002). As a result of this, executives see training departments as expense centers, instead of revenue generators. They cut training budgets easily. As a solution, trainings must be linked to business goals and measures. Training evaluations must be implemented ideally in Kirkpatrick level 3 (transfer) and 4 (effect on business).

For example “%80 of the incidents must be solved by level 1 support” may be a business goal. As a consequence of this, related trainings must be implemented to advance level 1 support employees’ expertise. Evaluations must be conducted to see Kirkpatrick level 3 and level 4 effects.

Benefit of learning goal autonomy is determined by learners knowledge. To evaluate learners’ level, pretest may be conducted.

If learners are in novice level for the course content, goal autonomy is useless. Instructor should use direct instruction and specific task oriented guidance for the

learners. This is useful to elevate learners' competence for the subject matter. According to Pratt (1988), learners may also need emotional support. Instructor should give positive feedback to increase confidence and explain importance of goals to increase commitment. Grow (1991) also recommends insight methods such as developing critical awareness of one's life situations and needs analysis.

If participants have intrinsic motivation besides prior experience on subject, goal autonomy unleashes their potential. These participants will learn more and engage more and dedicate more time. Intrinsic motivation may be measured by self-report of interest and enjoyment for the activity engagement.

#### **5.4 Recommendations for Future Research**

This study was conducted in a technical training context. Training directly addresses ability to do specific activity after the training event. As a result of this, trainings include very specific and focused content. Unix/Linux fundamentals technical training may be difficult for customization of goals. Broader trainings may be more appropriate for goal autonomy. The same study can also be conducted in education setting which aims conceptual or theoretical content acquisition. Education context is much more appropriate for personalized goals as topics are broader compared to training context.

The same study can be conducted within an environment where means for goal autonomy were strengthened and increased. In this course, instructor provided resources (PDF documents, Web addresses etc.) for all course units, announced him as a resource before and after the course hours, presented alternative modules to increase autonomy. Goal autonomy can be also strengthened by providing well-prepared learning environments.

Montessori Method is known for individual self-guided activity and child-centered approach (Al, Sari, & Kahya, 2012). For this philosophy to work, Montessori Method asserts that well-prepared learning environments with planned materials are

very important for children. Montessori schools have well-prepared materials which are generally wooden-made learning tools. Children can learn shapes, numbers and volumes through these materials. Montessori teachers present (or explain the usage of) materials to students. After this presentation, children are free to select and play with materials (Al, Sari, & Kahya, 2012). Children's interest determines which material to use. The same assertion can be checked through another study with lab environments.

Enriched learning environments such as scenarios and labs may be more appropriate to make goals more concrete and comprehensible. Labs or scenarios should be prepared with step-by-step instructions. While progressing through these labs and scenarios, learners should feel confidence and get higher levels of competence.

Ethnographic studies try to describe the part of reality which is seen by the native community members. In educational field, researcher tries to obtain an educational setting's picture as holistic as possible (Fraenkel, Wallen, & Hyun, 2012, p.507). Cognitive ethnography tries the same to understand cognitive processes and context. For this study, cognitive ethnographic research method may be used to unveil perceptions of participants encountered with learning goal autonomy.



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## APPENDIX A

### INFORMED CONSENT FORM

Kursun eđitmeni olarak sizlerle 5 gn boyunca eđitimdeydik. Kurum ii eđitmen olmamın yanında, yksek lisans da yapıyorum. Tez konum đrenme hedef zerkliđinin başarıya etkisinin llmesi. Verdiđim eđitimler aracılıđıyla bilgi topluyorum. Ařađıdaki soruların cevaplanmasında yardımını rica ediyorum.

Bu eđitimde sizinle daha nce yapmadıđım bir řey denedik. Kursun bařında, đrenme hedeflerini semekte sizi zgr bıraktım. Neleri đrenmek istediđinizi belirleme hakkına sahip oldunuz. Normalde bunu eđitmen belirler ve sizler buna bađlı kalmak zorundasınızdır. Size bununla ilgili birkaç řey sormak istiyorum.

Cevaplarken řunları bilmenizi isterim: Cevaplarınız bilimsel bir arařtırmaya kaynak teřkil edecek. Benimle, sizinle, alıřtıđımız kurum akademi birimiyle veya kursla ilgili bir deđerlendirme yapmayı amalamıyor. Bu yzden drst ve aık olmanız nemli. Nasıl dřnmř ve hissetmiřseniz belirtin. Evet/hayır gibi kısa cevaplar yerine duygu ve dřncelerinizi paylařabilirseniz sevinirim. Bu bilgileri de hibir řekilde sizin kimliđinizi ortaya ıkararak paylařmayacađım. Tm bilgiler anonim olarak bilimsel tezimde ve yayınlarda kullanılacaktır.

Cevaplarınız iin řimdiden teřekkr ederim...



## APPENDIX B

### INTERVIEW QUESTIONS

1- Aşağıdaki bilgileri belirtebilir misiniz?

- a) Mezun olduğunuz üniversite/yüksekokul ve bölüm:
- b) Kaç yıldır aktif olarak mesleğinizde çalışıyorsunuz:
- c) Yaşınız:
- d) Kurumda çalışma süreniz:
- e) Unix/Linux Sistemlerle -aktif olarak- çalışma süreniz:

2- Kursa katılımdaki motivasyonunuz neydi? Neden bu kursa geldiniz?

3- Eğitimin başında, linux/Unix öğrenmeye karşı içsel bir motivasyonunuz (kişisel merakınız) var mıydı? Bunu anlamamanın en kolay yolu, bu kurstan önceki dönemde, iş amaçları dışında, ara ara bu konularda bilgi toplamanız (Blog vb yerlere) veya bir şeyler denemenizdir (linux kurma veya kurulu ortamlarda yeni şeyler deneme)

4- Kursta, öğrenme hedeflerinin sizin tarafınızdan belirlenebileceği belirtildiğinde neler düşündünüz ve hissettiniz? Burayı biraz açıklarsanız sevinirim.

5- Kursun başında Öğrenme hedeflerinin üzerinden gidilmesi kurs konularının iş/kişisel hayatınıza nasıl hizmet ettiğini açıkladı mı? Yani öğrenme hedeflerinin sizin için ne anlama geldiğini anlayabildiniz mi?

6- Kurs öğrenme hedeflerini belirleme özgürlüğünü gerçekten **hissettiniz** mi? Açıklar mısınız?

7- Öğrenme hedeflerini seçmekteki "Ben belirliyorum veya karar veriyorum" hissi öğrenme motivasyonunuzu arttırdı mı? Bunun neden böyle olduğunu açıklar mısınız (motivasyon neden arttı veya artmadı). Burayı biraz açıklarsanız sevinirim.

8- Öğrenme hedeflerini belirleme özgürlüğünün daha iyi çalışabilmesi için önerileriniz var mı? Eğitimci, öğrenme hedefleri belirleme özgürlüğünü nasıl sağlayabilir? Böylece, öğrenciler (faydasız buldukları veya ilgilerini kayb ettikleri) standart içerik yerine öğrenmek istedikleri konularda ilerleyebilirler.

9- Eğitimci sizi anladı mı? Size cevap vermeden önce sizin ne düşündüğünüzü/hissettiğinizi anlamaya çalıştı mı?

10- Eğitimci size eğitim boyunca seçenek ve alternatifler sundu mu? Yoksa tüm seçimleri eğitimcinin yaptığı bir eğitim mi işlendi?



## APPENDIX C

### PRETEST/POSTTEST QUESTIONS

#### Pretest Questions

1. Hangi komutla linux kullanıcı parolamı değiştirebilirim?
  - a. password
  - b. chpw
  - c. passwd
  - d. changepw
  - e. Bilmiyorum
2. Linux sunucunun (IP adresi: 4.4.4.4) 110 numaralı portunda dinleyen bir servis olup olmadığını kendi PC'inden hangi komutla test edebilirim?
  - a. ping 4.4.4.4 -port 110
  - b. telnet 4.4.4.4 110
  - c. service 4.4.4.4 -p 110
  - d. ssh 4.4.4.4 -p 110
  - e. Bilmiyorum
3. Büyük kurumlar için bilgisayar sistemlerinin seçiminde en önemli karar unsuru hangisidir?
  - a. Güvenlik
  - b. Satış sonrası destek
  - c. Servis sürekliliği
  - d. Kullanım Kolaylığı
  - e. Bilmiyorum
4. fedora hakkında aşağıdakilerden hangisi doğrudur?
  - a. Bir linux masaüstü dağıtımıdır.
  - b. Bir linux sunucu dağıtımıdır.

- c. Bir unix türevidir.
  - d. Artık kullanılan bir unix türevidir.
  - e. Bilmiyorum
5. /etc/passwd dosyası içeriğini ekrana bastırmak istiyorsunuz. Bunu hangi komutla yapabiliriz?
- a. type passwd
  - b. cat /etc/passwd
  - c. show /etc/passwd
  - d. print passwd
  - e. Bilmiyorum
6. Linux sunucuya bağlandınız ve /home/ogrenci dizini altındasınız. Bu dizinin /tmp altında bir kopyasını oluşturmak istiyorsunuz. Bunu hangi komutla yapabiliriz?
- a. copy /home/ogrenci /tmp
  - b. cp -r /home/ogrenci /tmp
  - c. mv -r /home/ogrenci /tmp
  - d. copy -r /home/ogrenci /tmp
  - e. Bilmiyorum
7. printer adında bir dosya var. Bir dosyanın hakları rw-rw-rw- dir. Sizin kullanıcı grubunuz ile dosyanın grubu aynıdır. Dosyayı çalıştırabilmeniz için root kullanıcısı size hangi komutla izin vermeli?
- a. chmod g+x printer
  - b. mod g+x printer
  - c. permit a+x printer
  - d. right u+x printer
  - e. Bilmiyorum
8. /tmp/ogrenci dizini, sizin daha önce oluşturduğumuz bir dizindir. Bu dizine sadece ahmet arkadaşımızın girebilmesi (cd yapabilmesi) için hangi komutu kullanmalıyız?
- a. chmod g+x ahmet /tmp/ogrenci
  - b. setfacl -m u:ahmet:x /tmp/ogrenci
  - c. chmod +x ahmet

- d. `getfacl -m u:ahmet:x /tmp/ogrenci`
  - e. Bilmiyorum
9. DISPLAY kabuk deęişkeni içerięini ekrana nasıl basarız?
- a. `show DISPLAY`
  - b. `print $DISPLAY`
  - c. `write DISPLAY`
  - d. `echo $DISPLAY`
  - e. Bilmiyorum
10. Bir dizinde kaç adet dosya ve izin olduęunu ekrana bastırmak istiyoruz. Nasıl yaparız?
- a. `ls -count`
  - b. `ls -c`
  - c. `ls | wc -w`
  - d. `ls | count`
  - e. Bilmiyorum
11. Aşağıdakilerden hangisi unix/linux ortamlarında kullanılan bir metin düzenleyici aracı deęildir?
- a. vim
  - b. pico
  - c. nano
  - d. pato
  - e. Bilmiyorum
12. Linux ortamında kullanılan karakter setini UNICODE (UTF8) yapmak için hangi komut kullanılır?
- a. `export LANG=en_US.utf8`
  - b. `LANGUAGE=en_US.utf8`
  - c. `ENV=en_US.utf8`
  - d. `export ENV=en_US.utf8`
  - e. Bilmiyorum
13. Linux dosya sistemi üzerinde proje.txt dosyasını aramak için hangi komutu kullanmalıyız?
- a. `search proje.txt`

- b. find / -name proje.txt
- c. show -name proje.txt
- d. dir /s proje.txt
- e. Bilmiyorum

14. isimler.txt dosyası içerisinde karışık olarak isimler yer almaktadır. Bunları alfabetik sıraya göre ekrana basılmasını nasıl sağlarım?

- a. print -sort isimler.txt
- b. show -s isimler.txt
- c. grep isimler.txt
- d. sort isimler.txt
- e. Bilmiyorum

15. Linux sistem üzerinde çalışmakta olan tüm işlemleri (çalışan uygulamaları) nasıl listeleyebilirim?

- a. ps -ef
- b. process -all
- c. show process
- d. list -p
- e. Bilmiyorum

16. CPU kaynağının ne kadar yoğun kullanımda olduğunu anlamak için hangi komutu kullanabiliriz?

- a. top
- b. show cpu
- c. cpu
- d. free
- e. Bilmiyorum

17. /home/ogrenci dizini altındaki tüm dosya ve klasörlerin tek bir dosya olarak arşivlenmesini istiyorum. Nasıl yaparım?

- a. pico -arch /home/ogrenci
- b. tar -cvf ogrenci.tar /home/ogrenci
- c. zip ogrenci.tar /home/ogrenci
- d. single /home/ogrenci
- e. Bilmiyorum

18. Elimizde sıkıştırılmış halde bulunan ogrenci.gz dosyası bulunmakta. Bunu nasıl geri açabiliriz?
- gzip -u ogrenci.gz
  - gunzip ogrenci.gz
  - uncompress ogrenci.gz
  - gz -u ogrenci.gz
  - Bilmiyorum
19. Betik (script) içerisinde X değişkenine 2 eklemek istiyoruz. Bunu nasıl yaparız?
- X=X+2
  - \$X=\$X+2
  - let X=X+2
  - assign X=X+2
  - Bilmiyorum
20. ornek.sh adında yeni bir betik (script) yazdınız. Bunu önce çalıştırılabilir yapmak, ardından çalıştırmak istiyorsunuz. Nasıl yaparsınız?
- mod -x ornek ve ornek.txt
  - chmod +x ornek.sh ve ./ornek.sh
  - chmod u-x ornek.sh ve run ornek.sh
  - set -x ornek.sh ve set ornek.sh
  - Bilmiyorum

### Posttest Questions

- Linux üzerinde hangi komutla tarih ve zamanı ekrana basabilirim?
  - time
  - showdate
  - date
  - td
  - Bilmiyorum
- Windows file explorer (dosya yöneticisi) aracını kullanarak linux sisteme (IP adresi: 4.4.4.4) bir dosya yüklemek istiyorum. Bunu yapabilmek için dosya yöneticisi adres çubuğuna ne yazmalıyım?

- a. ftp://4.4.4.4
  - b. 4.4.4.4:21
  - c. ftp://4.4.4.4:21
  - d. Dosya yöneticisi ile bu işi yapamayız
  - e. Bilmiyorum
3. Üzerinde çalıştığımız sunucunun linux veya unix olduğunu hangi komutla görebiliriz?
- a. version -a
  - b. uname -a
  - c. shver
  - d. islinux
  - e. Bilmiyorum
4. AIX hakkında aşağıdakilerden hangisi doğrudur?
- a. Bir Linux dağıtımdır.
  - b. Bir Unix türevidir.
  - c. Artık kullanılmayan bir Unix türevidir.
  - d. Macintosh bilgisayarlarda kullanılacak yeni işletim sisteminin adıdır.
  - e. Bilmiyorum.
5. /home/TMS dizini altında belgeler adında bir dizin oluşturmak istiyorsunuz. Nasıl yaparsınız?
- a. mkdir /TMS/belgeler
  - b. mkdir belgeler
  - c. createdir belgeler
  - d. createdir /home/ogrenci/TMS/belgeler
  - e. Bilmiyorum
6. Linux sunucuya bağlandınız ve /home/ogrenci dizini altundasınız. Bu dizin altındaki proje.xls dosyasını /tmp altına taşımak istiyorsunuz. Bunu hangi komutla yaparsınız?
- a. cp proje.xls /tmp
  - b. copy proje.xls /tmp
  - c. mv proje.xls /tmp
  - d. move proje.xls /tmp

- e. Bilmiyorum
7. /tmp/ogrenci dizini, sizin daha önce oluşturduğumuz bir dizindir. Diğer tüm kullanıcıların bu dizine girmesini engellemek için hangi komutu kullanırsınız?
- chmod u+rwx /tmp/ogrenci
  - setfacl -m u:ogrenci: /tmp/ogrenci
  - chmod g-rwx,o-rwx /tmp/ogrenci
  - setfacl -m u:ogrenci:rwx /tmp/ogrenci
  - Bilmiyorum
8. Bundan sonra oluşturacağımız her dosya için, varsayılan (default) olarak herkese rw-rw-rw haklarını ayarlamak için hangi komut kullanılır?
- chmod rw-rw-rw-
  - setfacl -m u:everyone:rw
  - perm rw-rw-rw-
  - umask 000
  - Bilmiyorum
9. Uzantısı txt olan dosyaları nasıl listeleriz?
- ls \*txt
  - echo txt
  - directory txt
  - print \*txt
  - Bilmiyorum
10. patcher adlı uygulama çalışırken ürettiği çıktıları ekrana basmaktadır. Bu çıktıyı, çalışma esnasında ekran yerine output.txt dosyasına yönlendirmek istiyoruz. Nasıl yaparız?
- patcher >output.txt
  - patcher output.txt
  - run patcher output.txt
  - save patcher output.txt
  - Bilmiyorum
11. vi üzerinde ileriye doğru arama (find işlevi) yapmak için hangi karakter kullanılır?
- :

- b. /
- c. {
- d. f
- e. Bilmiyorum

12. Windows makineden linux sunucuya dosya transfer edildi. Bu dosya linux üzerinde bir metin editörü ile açıldığında satır sonlarında “^M” işareti olduğu görüldü. Bunun sebebi ne olabilir

- a. Linux metin editörü yanlış bir parametreyle başlatılmış.
- b. Windows ve linux makineler arası karakter seti uyumsuz
- c. Dosya ftp aracı ile transfer edilirken ASCII modda transfer edilmemiş.
- d. Dosya ftp transferi sırasında bozulmuş.
- e. Bilmiyorum

13. kitap.txt dosyası üzerinde, içerisinde unix geçen satırların ekrana basılmasını istiyorum. Nasıl yaparım?

- a. find unix kitap.txt
- b. grep unix kitap.txt
- c. print unix kitap.txt
- d. show unix print.txt
- e. Bilmiyorum

14. ucret.txt dosyası içerisinde sırasıyla maaş ve sicil numaraları yer almaktadır. Maaş ve sicil alanları “;” (noktalı virgül) karakteriyle birbirinden ayrılmıştır. Sadece maaş bilgilerinin ekrana basılmasını nasıl sağlarım?

- a. grep 1 ucret.txt
- b. cut -d ; -f 1 ucret.txt
- c. show -f 1 ucret.txt
- d. print -f 1 -d ; ucret.txt
- e. Bilmiyorum

15. patch adlı işlemin işlem numarası (PID) 718’dir. Bu işlemi sonlandırmak için hangi komutu kullanırım?

- a. kill 718
- b. end 718
- c. terminate 718



- d. process -stop 718
  - e. Bilmiyorum
16. Disk üzerinde ne kadar boş alan kaldığını nasıl görebiliriz?
- a. disk free
  - b. disk -list
  - c. df free
  - d. df -h
  - e. Bilmiyorum
17. Elimde ogrenci.tgz adında bir dosya var. Bu sıkıştırılmış dosyayı nasıl açarım?
- a. unzip ogrenci.tgz
  - b. uncompress ogrenci.tgz
  - c. tar -xzvf ogrenci.tgz
  - d. gunzip -x ogrenci.tgz
  - e. Bilmiyorum
18. proje.tar dosyası içerisindeki dosyaların listesini (dosyaları açmadan)görmek için hangi komutu kullanmalıyım?
- a. tar -tvf proje.tar
  - b. unzip -list proje.tar
  - c. gunzip -l proje.tar
  - d. untar -f proje.tar
  - e. Bilmiyorum
19. Bir betik (script), çalıştırıldığında kullanıcı adını sormakta ve ekrana “merhaba kullanıcı\_adi” şeklinde bir çıktı basmaktadır. Mesela kullanıcı adı selcuk ise ekrana “merhaba selcuk” basılmaktadır. Bu betik içerisinde kullanıcıdan ismi almak için hangi komutu kullanmalıyız
- a. scanf ISIM
  - b. get ISIM
  - c. echo ISIM
  - d. read ISIM
  - e. Bilmiyorum
20. Yazdığımız bir betiği (script) zamanlanmış görev olarak linux sisteme atamak istiyoruz. Hangi komutu kullanırız

- a. schedule
- b. cron
- c. crontab
- d. timer
- e. Bilmiyorum

## APPENDIX D

### ABOUT THE UNIX/LINUX FUNDAMENTALS COURSE

“Unix/Linux Fundamentals” course is a 5-days long training. It aims participants to be able to use Unix/Linux servers as an end user effectively. It consists of 10 units and includes the following learning objectives;

#### 1. Accessing Remote Systems

- a. Connect remote Unix/Linux systems via CLI and X Window GUI
- b. Use basic commands (man, passwd, date, w, id, cal)
- c. Transfer files between Unix/Linux system and windows PC via FTP protocol

#### 2. What is Unix/Linux

- a. Distinguish enterprise needs.
- b. Explain Unix flavors and Linux distributions.
- c. Identify the operating system information.

#### 3. Working with Files and Directories

- a. Discover Windows and Linux file systems
- b. Do file/directory operations (copy, remove, create...)

#### 4. Permissions

- a. Identify the problems related with permissions and recommend a solution
- b. Assign permissions for files/directories

#### 5. Bash Shell

- a. Use the features of shell (tab completion, history, environment variables, startup files, wildcards and quoting)
- b. Redirect application/file IO

#### 6. Text Editor

- a. Edit a file
- b. Solve character set problems

### **7. Advanced Operations on Files and Directories**

- a. Process files/directories in a smart way (Search file system, search pattern, count lines, sort files etc.)

### **8. Working with Processes**

- a. Distinguish job, process and daemon concepts
- b. List, kill and start processes
- c. Evaluate the utilization of system resources (CPU, disk, memory)

### **9. Archiving and Compressing**

- a. Create, list contents and extract an archive
- b. Compress and decompress an archive

### **10. Shell programming**

- a. Write scripts
- b. Deploy scripts as scheduled jobs

Students participate in a Kirkpatrick level 1 evaluation (reaction) at the end of the course. They express their thoughts and feelings about the course. There is no summative evaluation at the end of the course which determines failure or success for the students. All of the students who participate the class sessions are accepted as successful.