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*RESEARCH ARTICLE*

# THE IMPACT OF FLIPPED CLASSROOM MODEL AND LEARNER SELF- REGULATION ON PERCEIVED EXPERIENCE, SENSE OF COMMUNITY AND E-LEARNING PROJECTS PERFORMANCE

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## Abstract

The flipped or inverted classroom model is one in which the time and place for traditional lecture and homework are reversed. Traditional lecture is replaced by online videos assigned as homework. This frees up time in class to be spent with more student centered activities such as discussion based concept questions and group problem solving. While growing in popularity, research on the effectiveness of this format is mixed and inconsistent. The present study was designed to investigate the impact of the flipped classroom model on learner experience with the classroom environment, perceived sense of community and e -learning projects performance. Learner self-regulation was also investigated as a moderating variable. 97 male students, between the ages of 18-21, from the Faculty of Education Baha University, participated in the study and assigned to either a flipped classroom environment (N=51) or a traditional classroom environment (N=46). Before assignments to the conditions, learners were asked to respond to a 55- item self-regulation questionnaire. Further, after the experiment, students received three measurements to assess their experience with the environments (40-item questionnaire type scale), sense of community (43-items scale) and e-learning projects performance (3 e-learning performance rubrics). Data were analyzed using Analysis of Variance (ANOVA). The analysis revealed several significant differences: 1) there was a main effect of the classroom environment on student experience with the environment, perceived sense of community and e -learning projects performance, with the flipped classroom group showing more positive experience and more feelings of community as well as better e-learning projects performance; 2) learner self-regulation was found to have a moderating effect with respect to experience in the learning environment, sense of community and e -learning projects performance. The results of the study were discussed in terms of their implications for designing better and effective classroom learning environment that promote student engagements and learning.



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## Introduction:-

The face-to-face model of a number of lectures plus a single tutorial each week has been a standard approach to course delivery in higher education for decades. Despite the revolution that the internet has been to instruction in providing flexible access to course material, tradition dictates that a number of hours each week be set aside for formal lectures and tutorials.

The maintenance of the formal lecture and tutorial structure is despite significant evidence that the traditional lecture format is not the most effective way for most students to learn. One approach to a more active student experience is through a "flipped learning" model introduced first by Baker (2000) and Lage, Platt, and Treglia (2000).

At the heart of the flipped learning is moving the delivery of material outside of formal class time (through the use of extensive notes, video recorded lectures and other appropriate means) and using formal class time for students to undertake collaborative and interactive activities relevant to that material.

This paper reports on a move to a flipped learning approach in a compulsory fourth-year course (Level Seven) in the undergraduate education program at the Faculty of Education, Baha University in Saudi Arabia. The course titled: "e-learning applications". Further, because using a new model in learning such as the flipped learning model is unknown its effectiveness in learning, so it was important for the present study to identify the perceptions of students about this model. Given that the most essential part of the flipped learning model is to invert the process of learning, in which the traditional lecture is moved outside of class, usually delivered through some electronic means, and moving the practical applications assignments, formally homework, into the classroom (Educause, 2012).

The flip provides more time for active learning to happen in the classroom setting, and encourages instructors to view incorporation of active learning as a core component of teaching, rather than supplemental to a lecture (Gannod, Burge, & Helmic, 2008). Increased one-on-one interaction between student and teacher is a by-product of allowing students to engage with concepts, learning materials, and peers in the classroom. By structuring exercises that allow students to manage themselves in small groups or individually, instructors can address questions and problems as students encounter them and check in with individuals and groups around the classroom as students' work (Lage, et al., 2000). In fact, Enfield (2013) identifies the support component of classroom application as the specific rationale for using the flip, citing student difficulty with unfamiliar material in homework, and the opportunity that in-class work would provide. The interaction with content, learner, instructor and feedback that students receive with the flipped classroom may enhance a sense of community which is an important element discussed in the present study.

The second important variable of the present study is learner self-regulation. Based on Zimmerman (1989a), self-regulated learning is defined as the degree to which students are meta- cognitively, motivationally, and behaviorally active participants in their own learning. A combination of cognitive, metacognitive, motivational and behavioral processes is needed in the pursuit of learning goals.

Cognitive processes refer to the strategies that learners use to attain or comprehend knowledge or information. Metacognitive processes involve learners' ability to set up plans, schedules, or goals to monitor or evaluate their learning progress. Motivational processes indicate that learners are self-motivated and willing to take responsibility for their successes or failures. Behavior consists of seeking help from others to optimize learning (Zimmerman & Martinez-Pons, 1988). Self-regulated learning assumes a reciprocal causation among personal, behavioral, and environmental influence processes (Zimmerman, 1989a).

Self-regulated learning has been recognized as one of the influential components of academic achievement in traditional classroom learning (Pintrich & De Groot, 1990).

Most research shows that students willing to utilize as many self- regulated strategies as possible tend to succeed in their academic learning, more than their counterparts who use them less often. Moreover, high self-regulated learners are more self- efficacious in learning than those with poor self- regulation skills. Self-regulated learners believe they can exert self-regulatory skills to help them learn efficiently. Successes are attributed to their personal competencies and effort, failures to the use of ineffective strategies or correctable causes. By way of contrast, low self-regulatory learners ascribe their failure to limited ability or insufficient effort (Schunk, 2005).

Compared to traditional classroom learning, which is usually considered more teacher-centered, flipped learning is more student-centered and students assume more responsibilities in the flipped learning environments. In light of the characteristics of flipped learning such as flexibility, demands of more student efforts, and learner-centeredness, it is presumed that the ability of utilizing self-regulatory skills to set up learning goals, monitor their learning progress, seek help when needed and manage the time is of importance and necessary specially to flipped learners. The present study is interested in investigating the effect of self-regulation of learners on learning, perception and sense of community in the flipped learning environment.

**Statement Of The Problem:**

Flipped classroom learning model is a new innovation that can provide instructional designers, educators and instructional technologists with a way for designing the instructional environments to enhance learning and engagement. With the advancement of new technology and the availability of this technology with almost all students in schools and universities, students may get the most benefits of the flipped classroom since so many students are already perusing YouTube or other Internet sites while doing their homework, why not encourage students to use the devices for their homework? Consequently, students who have grown up with unlimited access to technology are not as wowed by the flipped classroom concept as many teachers think. These students are already used to utilizing technology to participate in many of their everyday activities. Why would learning be any different? Learning and instruction should not be far from the advancement in everyday life technologies. The flipped classroom as a new paradigm shift in how to offer learners individual and group activities and invest their time in working with the learning material, peers and instructors, could make a radical change in the traditional education system.

On reality, researches and studies adopted the flipped classroom model to enhance and improve students' experience and learning have provided inconsistent and inclusive results, and so the questions considered in the present study are important topics for investigation for four reasons. First, previous studies focused on just the bad side of the flipped classroom model, that is, providing students a video lecture instead of traditional lecture as homework, but most studies did not provide teachers and designers with the manners in designing classroom activities which are the most important factor in the flipped classroom. Further, these studies showed discrepancies in findings and results; some of them indicated the superiority of the flipped classroom model over the traditional model while others showed no difference or some superiority of the traditional classroom. These discrepancies may have been shown because most of them interested in enhancing lower order learning such as achievement.

Another reason of the inconsistent in results was possibly the lower experience of teachers who applied the classroom model. Those teachers probably have no such experience in managing the in-class activities in the flipped classroom.

Second, previous research in flipped classroom has studied the impact of the model with no consideration being taken of the learners' variables. Some students may not be able to regulate their learning with the new model of teaching; they may fail to organize their time; they may not use appropriate strategies to fulfill the requirements of the new model. Therefore, taking individual difference variables such as self-regulation could provide developers and designers another step forward to study the impact of the model.

Other variables such as self-efficacy, cognitive style and so on may moderate the impact of the model.

Third, because the flipped classroom offers a different mode of delivery of the same content students have likely already encountered, this allows them to experience learning the content in a different way. For this reason, student experience in the new flipped environment and their sense of community had to be studied in order to estimate their views and opinions about the new model. These views and opinions should provide guidelines and suggestions for designers and teachers to enhance their students' experiences and engagement.

Forth, this study was designed to contribute additional information to the body of knowledge within the field of teaching and learning and instructional technology that may enable designers and instructors to assign optimal classroom methods for learners. In order to add to the body of literature, more investigation need to be conducted on whether this new model will enhance greater learning and improve positive experience and interaction for learners.

**The Study Purposes:**

The purpose of this mixed method qualitative and quantitative study was to investigate the constructivist learning theory by comparing the flipped classroom learning environment with the traditional lecture learning environment. A comparison was made using student e-learning projects performance and student experience and sense of community with both instructional models, while considering the level of student self- regulation as the second variable as a moderator in an e-learning applications course at Faculty of Education, Baha University in Saudi Arabia. In supporting this purpose, the primary objectives are twofold. The first objective was to investigate the impact of the flipped classroom model on student perceptions, sense of community and e-learning skills. The second objective was to uncover whether or not a learner self-regulation (high vs. low self-regulation) would change leaner's perceptions, sense of community and e-learning performance.

**Questions:**

The present study addressed the following six questions:

1. How do students experience a flipped classroom model?
2. How do students perceive sense of community in the flipped classroom model?
3. Does student e-learning project performance as measured by e-learning rubrics be affected by the flipped classroom model?
4. Do student experiences with the classroom environment as measured by experience of classroom scale be affected by learner levels of self-regulation?
5. Do student perceived sense of community as measured by sense of community scale be affected by learner levels of self- regulation?
6. Does learner e-learning project performance as measured by e-learning rubrics be affected by learner levels of self-regulation?

**Significance Of The Study:**

This study should contribute theoretically and practically to the on-going technology-based learning research and modern teaching methods studies in university and school settings. The importance of the present study is as follows:

Like any educational reform, the decision to use the flipped classroom model emerged from this study should be based on the results of the scientific research in line with social, cultural and environmental contexts. Therefore, adopting the flipped model may require justifications for applying it in Arabic environments and this is what the present study was trying to uncover.

The flipped classroom model is a new innovation and a new teaching paradigm. For encouraging the use of this model, creating a community of awareness for people who interest in adopting this model by making information available for them should be the first step toward integrating this model in the educational system.

The results of the present study may provide teachers and instructors with lots of techniques that achieve the learning outcomes by selecting the most suitable resources available.

It is worth noting that instructors and teachers have a large amount of background in pedagogy and classroom management which may support the implementation of new instructional model. This study was a contributing factor in the organization and management of the details of the two different environments.

Although the primary goal of this work is research and not evaluation, the resulting model may help inform key decisions by practitioners in the flipped classroom environment seeking to improve student engagement.

**Hypotheses:**

The study has one independent variable (learning environment), one classified variable (learner self-regulation), and three dependent variables (perception of environment, sense of community and e-learning performance). The hypotheses of the study may be written as follows:

H1: with respect to the learning environment, there would be no significant difference at α=.05 in the perceptions of flipped classroom model as compared to the perceptions of traditional classroom model.
H2: with respect to the learning environment, there would be no significant difference at α=.05 in the perceived sense of community of flipped classroom model as compared to the perceived sense of community of traditional classroom model.
H3: with respect to the learning environment, there would be no significant difference at α=.05 in learner e-learning performance in flipped classroom model as compared to learner e-learning performance in traditional classroom model.
H4: with respect to the learner self-regulation, there would be no significant difference at α=.05 in the perceptions of the learning environment for high self-regulated learners as compared to the perceptions of the learning environment for low self-regulated learners.
H5: with respect to the learner self-regulation, there would be no significant difference at α=.05 in perceived sense of community of high self- regulated learners as compared to the perceived sense of community of low self-regulated learners.
H6: with respect to the learner self-regulation, there would be no significant difference at α=.05 in learner e-learning performance between high and low self-regulator learners.

## The Study Method:-

This quantitative study was designed as a nonequivalent between-subjects quasi-experiment to test the constructivist learning theory by comparing the flipped classroom model with the traditional lecture model with respect to three dependent variables such as e-learning performance, experience of the learning environment and perceived of sense of community in the learning environment. Level of self-regulation was taken as a moderator to uncover its effects on the dependent variables. The experimental method was the most appropriate research methods to achieve the objectives of the study.

### Participants

The participants of this study (N=97) were undergraduate students (level seven), at Baha University in Saudi Arabia, who were studying "Electronic Learning Applications" course as a Faculty of Education requirement. The course is 2 credits (3 teaching hours). Participants in the course were all male students ranged in ages from 18-21 years (M=19.2). The students were recruited from three departments and these were Art Education Department (N=28), Special Education Department (N=26), and Physical Education Department (N=53).

All students had a background and experience in dealing with the Learning Management Systems such as Moodle and Blackboard and using internet sites and social media such as Google, YouTube, and Facebook as a perquisite for the study. None of these students had experience learning with the flipped model.

### The Study Variables

The present study had one independent variable, one classified variable, and three dependent variables. These are presented next.

### The Independent and Classified Variables:

The present study had one independent variable, instructional environment, with two levels of this variable: (a) the flipped classroom environment and (b) the traditional face to face environment. The study also had one classified variable which was the level of learner self-regulation. These variable classified learners into high and low self-regulators.

### The Dependent Variables:

this study included three dependent variables: learner perceptions of learning environment, learner sense of community, and e-learning skills performance.

### Experimental Design

The quasi-experimental design was used to study the effects in the light of the independent variable level, and this is represented in table below. The learners in the present study were blocked by learning environment and learner self-regulation into four experimental groups as follows.

**Table 1:-** The study quasi-experimental design.

| | | Learning Environment | | Total |
|---|---|---|---|---|
| | | Flipped Classroom | Traditional F2F Classroom | |
| Self- Regulation | High Self- Regulation | 22 | 18 | 40 |
| | Low Self- Regulation | 29 | 28 | 57 |
| | Total | 51 | 46 | 97 |

Ninety-seven students participated in the present study. Of 97, 51 learners were assigned to the flipped classroom group and the other 46 assigned to the traditional face to face classroom group. In order to fully compare learning environments, subjects in the two groups were exposed to each learning environment separately. When one group does not receive the treatment it is considered the control (traditional F2F) and the other group exposed to a treatment, is considered the experimental group (flipped). This scenario is considered an experimental design. In a true experiment, participants or subjects in both groups are assigned based upon pre-existing characteristics to ensure group equivalency (Musallam, 2010). However, due to the nature of educational environments and difficulties to set appropriate time schedules for both groups, the students cannot be randomly assigned to groups or classes (Jackson, 2012). Therefore, this study is considered a quasi-experiment (almost experiment) design. The assignment to either flipped or traditional group was based on student preregistration in the course via the University Website Banner.

**The Study Tools**

Four study tools were designed and used in the present study, and these are as follows:

1. Self-Regulation Scale: a 55 item survey with a five-point response to measure seven dimensions of learner self-regulation.
2. Experience of Learning Environment Scale: two shapes of a 40 item scale with a five-point response to measure learner perceptions of the flipped and traditional learning environments.
3. Sense of Community Survey: a 43 item survey with a five-point response to measure learners' feelings toward interactions with the instructor and learners and feelings of connectedness to the learning community.
4. E-learning projects Rubrics: three rubrics for measuring student skills in creating personal blog, personal website, and a PowerPoint presentation. Rubric one was designed to measure the skills of creating an electronic website using Google Site application. Rubric two was designed to measure the skills of creating an electronic blog using Blogger website. Rubric three was designed to measure the skills of creating PowerPoint presentation using Google Forms.

**Definition Of Terms**

Podcast: Any series of audio files that can be downloaded from the Internet, often released on some regular schedule. Podcasts are named after Apple Computer, Inc.'s iPod portable audio players, though most podcasts are in a format that can be played on virtually any computer or smart phone. Vodcast: A vodcast is a podcast that also incorporates video in addition to audio. Vodcasting refers to teachers making and posting online videos. Screencast: A synonym for a vodcast.

**Flipped Classroom:**

The flipped classroom is a model of teaching in which a student's homework is the traditional lecture viewed outside of class on a vodcast. Then class time is spent on inquiry- based learning which would include what would traditionally be viewed as a student's homework assignment.

**Reversed Classroom:**

The reverse classroom is a synonym for the flipped classroom.

**Inverted Classroom:**

The inverted classroom is another synonym of the flipped classroom.

**Camtasia:**

Camtasia is a software studio that provides screen video and audio capture. It is published by TechSmith. The user defines the area of the screen or the window that is to be captured. Camtasia also allows the user to record audio from an external or internal microphone, as well as edit PPT presentation. There is also an option to place a webcam's video footage in the corner of the screen.

**Perceived Experience:**
Is defined in the present study as the views and opinions of participants on how the classroom environment was helpful in making learning meaningful, therefor, three important interaction types were reflected in the experience questionnaire. Students were requested to give their reflection on the learner-content, learner-learner, and learner-instructor interaction. The main objective of the experience of classroom was to have students' views about all types of interactions and engagement in the environment and if these types of interaction could encourage them to invite other students to have the same experience.

**Sense of Community:**
Sense of community is "a feeling that members have of belonging, a feeling that members matter to one another and to the group, and a shared faith that members' needs will be met through their commitments to be together" (McMillian & Chavis, 1986, p.9).

Self-regulation: self-regulation can be defined as “an active, constructive process whereby learners set goals for their learning and then attempt to monitor, regulate, and control their cognition, motivation and behavior, guided by and constrained by their goals and the contextual features of the environment” (Pintrich, 2000, p.453).

**Theoretical Framework**
The purpose of this chapter is to present an overview of the existing literature pertaining to this subject. Since this study seeks to compare the traditional model of teacher centered lectures to the flipped model as well as uncovers the effect of self-regulation, this chapter is divided in to five general sections: active versus passive learning, flipped classroom, research on flipped classroom, self-regulation and learning, and sense of community, and finally a robust conclusion that places this study in context of the literature.

**Active versus Passive Learning**
As the difference between passive and active learning will be key in the understanding the definitions of the traditional and flipped classrooms to be presented later in this review, it is appropriate to begin with an examination of those concepts. Passive learning could be described as learning that only involves the recording of information by the student's brain, but no active application of that information. Examples of these passive processes are when the teacher describes concepts to the student through a didactic lecture or works though example problems while the student follows along but has no input on how the problem is solved. Textbook reading, if it is done only to receive information, could also be considered a passive learning activity.

Though traditional lecture can certainly be active to at least some degree depending on the teacher, the traditional classroom lecture is generally a passive activity. This is not to say that passive learning is always a bad thing. In many educational settings, a foundation of facts is vital making passive learning a necessary step in the learning process. However, if higher-order cognitive processes such as analysis, synthesis, and evaluation as described by Bloom are the goal, then passive learning is not enough. Students must engage in active processes.

Exactly what active learning looks like is a bit more difficult to describe, primarily due to the fact that, as pointed out by Prince (2004), the term can have many different interpretations and includes traditional homework where students work through problems on their own. In-class active learning can be achieved simply by pausing in the middle of a lecture to allow students to confer with each other for a few moments to clarify notes, a method commonly called think-pair-share (McKeachie & Gibbs, 1999). It can include more elaborate methods such as collaborative learning where students work together on an exercise or problem-based learning where an open-ended real- world problem is presented at the beginning of instruction to provide the context and motivation for learning the underlying concepts (Mabrouk, 2007).

The key to active learning is that the students are engaged, either individually or in groups, and on their own to manipulate the information and concepts they have learned in novel ways.

**Traditional Classroom Learning**

Traditional lecture will always have a place in the way instructors teach. Often, large amounts of information need to be transmitted to students. Given the constraints of time and material that must be covered, traditional lectures are a practical way to accomplish this and there is research to support the continued use of this method for that purpose. However, as is clearly shown by a number of the works, to rely on it as the sole method of instruction is to do our students a disservice. A teacher should have many tools with which to teach, and those tools should include alternatives such as peer instruction and problem based learning. But having the time to use these tools when faced with a long prospectus of material to cover is often a problem. This is where the inverted classroom model holds such potential. Before investigating the flipped classroom in detail, first a definition of traditional classroom or traditional lecture is defined.

What exactly makes up a traditional classroom or a traditional lecture format is something that is often taken for granted. In almost all of the studies that will be mentioned throughout this literature review a comparison is made between some innovative teaching method and the traditional method. But what is this traditional teaching method? It is important to answer this question clearly so that any comparison to another format can be accurately understood.

In a study comparing guiding notes lectures to the traditional lecture by Williams, Weil, and Porter (2012), the traditional lecture is described as the instructor briefly asking if students have any questions on previously covered material before presenting the day's material using a large presentation screen. In another study comparing problem based learning to traditional lecture (Miller, 2003), the traditional lecture is defined as one in which the expert teacher is the giver of information while the students passively absorb it. While some particularly outgoing students may stop the lecture to ask for clarification or particularly engaging lecturers may punctuate their teaching with prodding questions, communication is largely one-way. King (1993) is credited with coining the phrase “sage on the stage” and it has become widely used as a broad label for the traditional lecture. Taken together, these give an overall picture of the traditional lecture method as the teacher-centered delivery of facts and information to passively listening students. At least we hope they are listening.

**Research for and against Traditional Classroom**

One of the influential works published by Couch and Mazur (2001) clearly shows the advantages of a lecture alternative called peer instruction. Students are expected to prepare for lectures by spending time reading the material before coming to class. Class time is then spent examining a series of conceptual questions where students discuss and present their answers and then try to convince others in their student group why their answer is correct if others disagree. Couch and Mazur present ten years of results from which show significantly greater learning with peer instruction when compared to traditional lecture. Their methods are very similar to the modern idea of a flipped classroom and provided the inspiration and model for much of what was implemented in my study.

Peer instruction is essentially an example of collaborative learning and other studies demonstrate the advantage of this active learning method. Thacker and others (1994) compare the problem solving performance of students in three traditional introductory physics courses to those in an inquiry-based course. In the inquiry-based course, students worked together through hands- on modules with the teacher taking the role of a guide rather than the giver of information. The study had a very limited scope, looking at the results of just two problems, one qualitative and one quantitative, relating to electric circuits, but their results are impressive. The inquiry group, composed of elementary education majors, performed as well as a group composed of honors students and significantly better than a group composed of engineering majors who were taught in a traditional class setting. Gokhale (1995) also conducted a study focusing on collaborative learning. Two sections of a basic electronics course each with 24 students was used to determine if working together would produce better results as measured by an author developed pre/post when compared to students working alone. Measurements involving both drill-and-practice problems and higher level critical thinking items were made. Results indicated no difference for performance on the drill-and-practice problems while the collaborative learners performed significantly better on the critical thinking problems. These studies suggest that if higher level thinking is our goal, having students spend time working together could have a benefit.

Another lecture alternative is problem-based learning and the research on this method is extensive. A meta-analysis by Dochy, Segers, Van den Bossche, and Gijbels (2003) collected the results of 43 studies focusing on the effects on outcomes in knowledge and skills. Not one study reported a negative effect on either outcome, and they found that though knowledge learned was slightly less with the problem-based approach, the knowledge that was gained was more likely to be retained.

These alternative methods listed in the previous section can have drawbacks and some research has produced results that at least partially favor traditional lecture. One such example is seen in Elby's (2001) study "Helping physics students learn how to learn". He uses an epistemological approach to teaching physics at the high school level that incorporates in-class discussions and reflections among other methods to achieve a deeper understanding of physics as a creative process with practical connections to their lives. This method resulted in highly favorable beliefs about physics. However, he does point out that the benefits of this method came at the cost of "radically reduced content coverage" when compared to other more traditional methods. The traditional lecture clearly is at the very least quite efficient at delivering information quickly. Research shows that that the traditional lecture is in fact quite effective if the goal is simply the transmission of information (Bligh, 2000). Schwerdt and Wuppermann (2011) report findings that are also in favor of the traditional lecture. Their examination of data from the Trends in International Mathematics and Science Study (TIMSS), shows that 8th grade students whose teachers spend more time on traditional lecture rather than group or individual problems solving learned more as measured by the TIMSS student achievement test. In some cases, such as Miller's (2003) comparison between traditional lecture and problem based learning mentioned earlier, the results are inconclusive and show no significant advantage of the alternative method over traditional lecture.

**Flipped Classroom:**

As pointed out by Goodwin and Miller (2013), there is an overall lack of hard scientific evidence either for or against the practice of flipping the classroom. One should recognize that the main advantage of the inverted model is that it allows time in class to be spent on methods for which there is a strong scientific basis. However, indirect evidence alone should not be considered as an answer to the question of the effectiveness of the inverted model. More research is needed that investigate this method, but some studies examining the flip itself do exist in the literature. But first, we must define what exactly the inverted or flipped classroom looks like.

**History of Flipped Classroom**

In the early 1960s, Novak began teaching evening physics classes. His students were adults, many who were already tired from a day of work. Novak wanted to find a way to modify his instructional approach to meet the needs of his students. He began breaking his physics content into smaller modules to be viewed prior to class. He then utilized active learning strategies during class to engage his students in discussion and problem solving (Rozycki, 1999). In the 1980s, student availability to the personal computer increased dramatically, so Novak modified his instructional approach and created a software program that allowed his students to work through physics problems outside of class and at their own pace. More recently, with the assistance of a teaching colleague, Novak developed a Web-based classroom strategy called Just-in-Time Teaching (JiTT). With the JiTT approach, students completed short assignments that were due immediately before class. The instructor read the students‟ responses and formatively altered the lesson to meet the needs of the students. Students came to class with prior knowledge of the subject content and spend the class time actively collaborating with peers and their teacher (Novak, 2006). The essential component of the Novak approach was to modify lecture content and require its viewing outside of class to make time for more active learning strategies during class. Essentially, this is the same pedagogical approach as flipped classroom.

In the early 1990s, Mazur, a physics professor at Harvard University, began experimenting with a strategy to increase student participation through active engagement. The underlying concept was to use formative questioning and an instructional strategy he called "peer instruction" to get students actively thinking and talking about physics concepts. Students were expected to read their physics textbooks prior to class to gain the requisite information to participate in the discussions. Reading the textbook prior to the class meeting meant less time had to be spent during class explaining the same basic concepts covered in detail in the textbook. Reducing the amount of time for lecture meant more time for peer instruction activities (Crouch, Watkins, Fagen, & Mazur, 2007, p. 14). Although Mazur and his colleagues were not using technology to "flip" their courses, they were in fact transforming the learning environment of their classes in much the same way as flipped classrooms today. Mazur transformed his lengthy lecture material into a series of short presentations covering key points in much the same way a flipped classroom teacher reduces the textbook to a series of key video lessons lasting no longer than fifteen minutes. During class, Mazur's students were given additional problems and encouraged to discuss their solutions with peers, often defending their method of solving the problems (Crouch et al., 2007).

Although Mazur's students expressed satisfaction with the new active format and consistently rated the class highly, many also complained that they had difficulty reading the technical physics textbook (Crouch et al., 2007, p.14). The peer instruction approach has not worked as well for other Harvard physics professors as it has for Mazur (Berrett, 2012). Melissa Franklin, then chair of Harvard's physics department explained why she believed peer instruction has not worked as well for all faculty members. She stated, it demands that faculty members be good at answering students‟ questions on the spot, even when their misconceptions are not yet clear because they are still processing the information. It can also be very labor intensive for faculty members who do not have teaching support…it requires a professor to read questions that students submit before class. (Berrett, 2012, p. 5)

**Emerging of Technology in the Flipped Classroom**

In 1996, researchers at Miami University in Ohio conducted an experiment that compared the learning preferences of students in an "inverted," introductory economics classroom format. The term, "inverted classroom," is often used synonymously with flipped learning or flipped classroom. The students averaged 18 years of age and were predominantly Caucasian from upper- middle class families. Researchers were interested in finding an instructional model that would accommodate the widest variety of learning styles with the least loss of content coverage. Researchers correlated the various models of learning styles from Reichmann and Grasha, Kolb, and Myers- Briggs to the types of multimedia from which students could choose (Lage et al., 2000, p.40). Students were required to read content material from their textbooks prior to discussing the topic in class. Optionally, they could view lectures on the topic that were available on VHS videotape. The videotape could be viewed in the library or copied for home viewing. Lecture material was also available in PowerPoint format with recorded narration. The PowerPoint files could be downloaded from a Web site or a printed copy could be purchased. The format of the inverted classroom included a question/answer session or a mini-lecture activity to clarify any misunderstandings from the assigned reading or lecture recordings. This was followed by an experiment or activity in which students actively discussed content material with each other and the instructor. Groups of students were also required to present content information to the entire class in an informal presentation (Lage et al., 2000).

Results of the Lage et al. (2000) study revealed that the majority of students were favorable toward the inverted classroom design. Students rated the inverted classroom a favorable score of 3.9 out of 5.0 on the Likert scale. Students rated group work a favorable score of 3.7 out of 5.0. Instructors in the study reported more student motivation and attributed this to the increased demand for students to take ownership of the learning process (Lage et al., 2000, p. 37). It was the conclusion of the study that the inverted classroom clearly allowed students of all learning styles to use the method that is best suited to their needs.

**Web 2.0 and Flipped Classroom**

In the years since the Novak and Mazur studies, instructional technology has radically improved. Obsolete VHS videotape has been replaced by online services such as YouTube and Google Services. These social media sites have made sharing via the Internet as easy as clicking on a hyperlink. Free learning management systems such as Moodle have become available to classroom teachers that incorporate lessons, multimedia, and assessments. New interactive textbooks are being created for use with mobile tablets such as the iPad, incorporating not only information, but interactive multimedia and video tutorials as well (Hu, 2011).

The ability to annotate lecture recordings has also re-energized the flipped classroom movement by enabling teachers with little or no professional development training to create interactive, informative mini-lectures and make these available to their students anywhere, anytime. Students view recorded tutorials or lectures at home, freeing up limited class time for more active learning strategies (Gannod, 2007; Kellogg, 2009; Walter- Perez & Dong, 2012). This revolution in instructional technology has many educators excited about the possibility of creating learning environments that promote individualized, personalized learning.

Referred to as the "inverted classroom" by their higher-education counterparts, this reversal of location where the subject content is introduced and where it is applied has recently been named flipped instruction by a new generation of K-12 educators. Although there are many variations, most teachers who "flip" their instruction are using video recordings of what they would normally cover in class as homework assignments for their students. Students watch the videos as they take notes and write down any questions they have (Alvarez, 2011; Bergmann & Sams, 2012).

Bergmann and Sams are two chemistry teachers that are given credit for bringing this innovative instructional strategy to the forefront of instructional technology and pedagogical discussions. They have provided perhaps the simplest and functional explanation of a "flipped classroom." Bergman and Sams stated, "Basically the concept of a flipped class is this; that which is traditionally done in class is now done at home; that which is traditionally done as homework is now completed in class" (Bergmann & Sams, 2012, p. 13). Both Bergmann and Sams are quick to clarify that they did not invent Flipped classroom and that there is no one single method for implementing the strategy. They created their own videos using screen-capture software and made it available to students online or as downloads to their students‟ mobile devices. Social media has contributed to the flipped classroom movement. Bergman, Sams, and others routinely post their video lessons online for other teachers to use. Online sharing and collaboration among flipped classroom practitioners is breaking many of the barriers to implementation and helping beginning flipped instructors incorporate videos created by others.

**Definition of Flipped Classroom**

Elements of the inverted classroom model have been around for quite some time. For as long as there have been textbooks, teachers have almost always assigned at-home reading as a preparation for lecture. The difference today is the availability and versatility of technology. Cheap yet high quality cameras are built into most smart phones and computers, screen capture software packages such as Camtasia (Smith & Smith, 2007) are inexpensive and relatively easy to use, and YouTube and other similar websites make publishing and accessing videos easier than ever. As a result, the idea of reversing the traditional place and time for lecture and homework, or flipping, has received a lot of attention in recent years.

Bergmann & Sams (2012) have most often been credited with coining the phrase „flipped classroom, ‟ which refers to "the use of technology to remove passive, one-way lecturing as the only means of teaching" (para. 6). Video lectures watched at home and activities completed during class time are the defining characteristics of a flipped classroom, which is also referred to as the„inverted classroom‟ (Lage, et al., 2000). However, Johnson (2013) reminded us in his recent study that the flipped classroom "should be viewed as a mindset rather than pedagogy" and that "educators are continuing to experiment with the flipped classroom strategies to meet their curricular needs" (p. 76). The concept of reversing content delivery and practice time is not a new phenomenon in education, but it is recently being redefined and improved along with the emergence of new technologies (Kachka, 2012). Kachka (2012) noted that "the increase of teacher-student interaction during class time is what characterizes the flipped classroom model's success" (para. 6). Similarly, Bergmann and Sams (2012) claimed that redirecting attention away from the teacher and putting attention on the learner and the learning is the most important feature of the flipped classroom.

Ash (2012) says the term flipping "comes from the idea of swapping homework for class work. Students are typically assigned the video-watching for homework, freeing up class time that used to be spent listening to lectures for hands-on activities and application of knowledge, which used to serve as homework" (p. 56). Berrett (2012) describes the flip as an inversion of expectations. Students do not passively receive information while in class but are expected to gather such information on their own outside of class through reading, videos, or podcasts. While in class, students do what is typically thought of as homework.

Bergmann and Sams (2012) describe the flipped classroom by comparing the use of class time to the traditional classroom. Their comparison for a typical high school classroom on a 90-minute block schedule is reproduced in Table 2. Much more time is available in class to be spent on putting knowledge into practice.

**Table 2:-** Comparison of class time in traditional versus flipped classrooms (adapted from Bergmann & Sams, 2012).

| Traditional Classroom | | Flipped Classroom | |
|---|---|---|---|
| Activity | Time | Activity | Time |
| Warm Up Activity | 5 min | Warm Up Activity | 5 min |
| Go Over Previous Night's Homework | 20 min | Question and Answer Time on Video | 10 min |
| Lecture New Content | 30-45 min | Guided and Independent Practice and/or Lab Activity | 75 min |
| Guided and Independent Practice and/or Lab Activity | 20-35 min | | |

Though this table is aimed at distinguishing the traditional and flipped models at the high school level, the comparison at the university level might not look much different with an even larger chunk of time spent lecturing on new content in the traditional university classroom.

It is important to note that the flipped classroom model can take on a variety of forms. As pointed out by Millard (2012), one teacher may choose to rely heavily on reading material with online supplements while another may offer only a block of videos in replace of traditional lecture. Others such as Goodwin and Miller (2013) and Stansbury (2011) offer similar definitions. The common factor in these varied definitions is where passive and active learning takes place. For the purposes of this study, the inverted classroom will be defined as one in which passive student processes take place outside of the classroom through lecture videos and active learning takes place inside the classroom through student discussion of conceptual questions and cooperative problem solving.

**Possible Benefits of the Flipped Classroom**

With any initiative, there are benefits and drawbacks. If the model of the flipped classroom is used correctly, the benefits are great. One of the biggest draws to implementing the flipped classroom is the positive feedback from students. In the 21st century, students are accustomed to high-tech gadgets and social media (Defour, 2013). They use these gadgets and resources as entertainment: why not use them as a means for instruction as well? Students are also great in the Internet and social media, and for many, have grown up only knowing these entities as an integral part of life, though they may not be intelligent in best use practices. Bergmann and Sams (2012) found one of their greatest frustrations to be that many of their students carried more powerful pieces of technology in their pockets than the computers in the computer labs at their schools. Since so many students are already perusing You Tube or other Internet sites while doing their homework, why not encourage students to use the devices for their homework? Consequently, students who have grown up with unlimited access to technology are not as wowed by the flipped classroom concept as many teachers think. These students are already used to utilizing technology to participate in many of their everyday activities. Why would learning be any different? Bergmann and Sams (2012) note that students' express excitement during the first few weeks, but after that the flipped classroom model simply becomes another expectation. And though Bergmann and Sams point out that students are not opposed to the model, they simply accept it because it becomes a point of normalcy in their lives, leading educators to believe that students will easily adapt to the instructional shift in the classroom (2012).

Quite possibly the greatest benefit to the flipped classroom is the face-to-face time spent with both teachers and peers. Goodwin and Miller (2013) accredit the flipped classroom with offering more time for feedback between teacher and student as well as better student-teacher interaction. Bergmann, one of the co-founders of the flipped classroom, reported that once he started utilizing the flipped model in his own classroom, he talked to every kid, every day, something he had never done in his previous 20 years teaching (as cited in "Flipped", 2011). It is also a way that students can take control of their learning by working at their own pace. If a lecture is moving along too quickly, and the student is too shy or embarrassed to ask the teacher to slow down, that student could inevitably miss crucial information necessary for working through formative assessments (Goodwin & Miller, 2013). When the lectures and instruction are committed to video, students can re-watch and rewind the portions they may miss the first time. Also, if students are sick or absent from school, which is inevitable, they will still receive the same instruction their peers received; they would just miss out on the face-to-face work time with their peers and teacher (Springen, 2013).

This type of instruction can also be beneficial for gifted or very involved students. Students who know they will be pre-occupied in the near future with sports, activities, vacations, or any other hindrance to their daily classes can work ahead in their classes by participating in the lecture ahead of time and asking for the work that accompanies it. Since the instructional piece is available to students to use at their leisure, students can work at their own pace. Bergmann and Sams (2012) reported one particular student who was involved in everything at their high school, most specifically as the Student Council president. As she knew Homecoming was approaching, she decided to work ahead in one of her flipped classes to be able to focus on all the demands Homecoming week would place on her. She used her time in Bergmann's class to do the work to plan the daily Homecoming activities since she was already caught up with the homework and the lectures. This student did not benefit from the hands-on collaborative work if she worked ahead; however, her need for collaboration may not have been as necessary as someone else. Regardless, she completed the work, though it was more of an independent study as opposed to collaboration.

Sams and Bergmann (2013) reported that the flipped classroom has also revolutionized the idea of differentiated instruction in the classroom. Since many teachers post their lessons ahead of time, students at a mastery level can move on to the next lesson without feeling bored or complacent. Sams and Bergmann relate an especially intriguing example of how differentiation is mandatory in a classroom: Allison, a 7th grade Spanish teacher, teaches a class made up of three different groups of students: those who are almost fluent in Spanish, those who have taken a few years of Spanish, and those who are taking Spanish for the first time. Using the flipped model, she is able to start at the beginning with those who need it, while still challenging those who are almost fluent in Spanish by assigning different lectures to view as homework and then working in their groups in class on different assignments, all the while collaborating with each other, which is another key benefit of the model (2013). The collaboration amongst students during the work time provides them with real-world exposure to collaboration, and it benefits in problem solving and work completion (Defour, 2013).

The flipped classroom is also praised because of the meaningful discussions it can spur after a video lecture the night before. Students find that they enjoy the classroom environment and material more because they end up leading the discussion and the learning. Many teachers require students to take notes on the lectures and then come to class prepared to ask a good, thoughtful question. In these questions & answer sessions, the entire class hears the questions and the answers, therefore creating an organic review of the material ("Flipped", 2011).

Another benefit is the time aspect: teachers who have flipped their classrooms have found that they can transform a lecture that used to take an entire class period and post it as a video in 8-10 minutes because they are not repeating themselves and answering questions during the lecture. They won't need to repeat themselves because students can rewind and re-watch. The questions that students have often are covered in the classroom question and answer session or as students embark on collaborative project-based learning (Springen, 2013). Ming, a teacher from Marine City High, found that after he flipped his classroom, he was able to build in 5-6 extra block-schedule days of instruction to his Advanced Placement (AP) Government class (Springen, 2013). Those extra days are crucial in helping students prepare for the exam that can potentially earn them college credits.

The idea of the flipped classroom is also grounded in brain research. Research has proven that teachers have an approximate ten-minute window to introduce and discuss new material before the students begin to lose interest (Goodwin & Miller, 2013). Since most video lectures tend to be around ten minutes, research states that students should be able to stay focused, and after the video is over, they should be able to progress to their next task. This contrasts greatly with some lectures that can take up an entire class period with students sitting much time in their desks for up to 45 minutes.

Another benefit is the fact that the model can cater to traditionally careless students. In any classroom, there will inevitably be students who refuse to do homework and possibly view the lessons; however, teachers using the flipped classroom model have found that students who traditionally failed on homework did the work because they didn't want to miss out on the collaboration with their peers during work time, and would rather work together than not work alone (Springen, 2013). Teachers must also be intelligent enough to separate those unprepared students to keep the collaboration work truly collaborative. There is no expert way to assess if students have read or watched podcasts, but most teachers do begin with some type of quiz or reading check (Bergmann & Sams, 2012).

Additionally, one of the greatest implications stemming from the flipped classroom is the shift of an initial student goal of completion of assignments to a true understanding of the material (Bergmann & Sams, 2012). Once students have the opportunity to engage in learning together, Bergmann and Sams noticed that students formed their own collaborative learning communities that were truly focused on learning rather than simply finishing work. Since the time to complete work was built in, students spent the collaborative time with peers and with the teacher truly striving for understanding. This particular benefit is only performed if the flipped classroom is adequately implemented. If teachers simply assign busy work, students will not feel challenged enough to find the value in the work. Bergmann and Sams wrote specifically about creating new "meaningful activities instead of completing busywork" (2012, p. 28).

One of the greatest benefits to the flipped classroom implementation lies in the proof. Though there have been no scientific studies to verify this, teachers report that they have witnessed improved test scores after flipping their classrooms (Defour, 2013). Goodwin and Miller also report that in a survey of 453 teachers who had flipped their classrooms, "67% reported improved test scores...80% reported improved student attitudes, and 99% said they would flip their classrooms again next year" (2013, p. 78). Parents also like the model because they could better help their students by viewing the lectures, knowing exactly what the teacher wanted the student to take from the lecture (Fulton, 2012). Parents have also reacted positively to the flipped classroom because they felt more connected to their students" education. The parents who choose to watch the videos and lectures understood how the teacher taught. Bergmann and Sams noted that the focus of their parent/teacher conferences changed drastically after parents were aware of how the learning was accomplished. There were fewer questions about whether the students were paying attention in class because parents had a firsthand account of how engaged and attentive the student was during the lecture (2012).

**Possible Drawbacks of the Flipped Classroom**

With any upside, there is always a downside. The resistance to the model has come from students, parents, and teachers, voicing numerous concerns. The main resistance from students has stemmed from the logical misconception that appeals to tradition, or "it's always been done that way." Students may have a tough time adjusting to homework that isn't necessarily scored or turned in. Students may also resist because they feel the Internet is an escape from their daily grind, and they don't want it to become a part of their workload (Defour, 2013). Another student concern is that if they watch the video and have immediate questions, how can they be answered? It isn't realistic for teachers to work 24/7, and some students feel that if they can't grasp the material at home, they will be ill-prepared for the hands-on work the next day (Springen, 2013).

Another misconception is that flipped learning is similar to an online course (Fink, 2011). Although online learning is-and will-continue to have a valuable place in the education spectrum, it must be noted that a flipped model does not change the amount of face-to-face time that a student spends in a classroom compared to a traditional classroom. However, the original definition of the flipped classroom, what used to be classwork (the lecture) is done at home via teacher-created videos, and what used to be homework (assigned problems) is now done in class (Bergmann & Sams, 2012), can imply that the flipped model can simply be online video lectures at home and a static use of class time for students to passively work on homework problems. This has led The Flipped Learning Network (2014) to release an updated and revised formal definition of flipped learning: "Flipped Learning is a pedagogical approach in which direct instruction moves from the group learning space to the individual learning space, and the resulting group space in transformed into a dynamic, interactive learning environment where the educator guides students as they apply concepts and engage creatively in the subject matter" (p.1).

This new definition emphasizes that in flipped learning, the way face-to-face time is spent is most important. Waddell (2012) argued that the videos are just taking a bad pedagogy (the in-class lecture) and putting it online. In fact, he argues that this is even worse as there is no chance during the videos for inquiry or collaboration. Yet he does concede that there would be greater classroom time for these activities. Critics also claim that it just reinforces the "sit-and-get" aspect of education without deeply engaging students.

Parents and teachers tend to resist because they learned via lecture (once again the appeal to tradition), so why can't their kids or students? Many teachers and administrators alike correctly argue that lectures aren't all bad, so why change or take that away? (Goodwin & Miller, 2013). There is also a major concern with those who want quantitative data to support the model: there isn't any, as there have been no formal studies released on the flipped classroom, as Goodwin and Miller report in 2013. This alone makes people nervous, but as Goodwin and Miller report, "If we only implemented strategies supported by decades of research, we'd never try anything new" (2013, p.78). Teachers are mostly concerned with the accountability aspect for students and how to hold them accountable for the work that was assigned via podcast. Springen writes that there are always students who refuse to do work: it wouldn't matter if it was a video lesson or a worksheet to be completed at home (2013). One of the most common criticisms of the flipped model is that it is about replacing teachers with lecture videos (Nochese, 2011). There is a fear that the proliferation of online instructional videos will be used as leverage to diminish the roles of teachers and that videos are taking the poor pedagogy of lecture and simply putting it online (Waddell, 2012).

Another major drawback or concern stems from the technology aspect. What do schools do with students without access to a computer or Internet? Most schools have found ways to remedy this by creating labs before and after school, sending home flash drives or DVDs, or providing the device (whether laptop or handheld device) to the student. More and more students own a device of their own (smart phone, iPad, etc.) that can be used to access the information as well. The other technology concern is the amount of screen time students will be exposed to. When parents hear that screen time should be limited, but their child comes home needing to be in front of a screen, they find themselves in a dilemma. Lastly, parents are concerned about the stress the flipped classroom will put on their own computer or devices. If parents have more than one child in the school or district, they worry that they may not have adequate equipment at home (computers, devices, etc.) to accommodate student technology needs to fulfill homework obligations (Fulton, 2012).

Lastly, teachers are specifically concerned about the management of the new model. They feel that they will be forced to do far more work by recording what they could easily do in front of their class, essentially placing more work on them in their planning period or at home (Defour, 2013). Many are also concerned about how the model will affect their classroom management. Teachers who like a quiet classroom may have a hard time adapting to a flipped classroom, as collaboration and group work (where moving furniture and scattering learners all over the room) is a key factor in making it work (Springen, 2013).

Another very valid concern is the assessment process. While collaboration is an integral component of the formative work, assessments, specifically summative assessments, have continued to be given individually. As of now, other courses may require students to pass traditional exams, so there is concern raised that students who learn collaboratively may struggle individually on standardized tests (Springen, 2013). All the concerns are legal, but with any concern, there is typically a way to modify the program to accommodate any issues.

**Research that Supports the Flipped Classroom**

As pointed out by Goodwin and Miller (2013), there is an overall lack of hard scientific evidence either for or against the practice of flipping the classroom. One should recognize that the main advantage of the inverted model is that it allows time in class to be spent on methods for which there is a strong scientific basis as described in the previous section. However, indirect evidence alone should not be considered as an answer to the question of the effectiveness of the inverted model. More research is needed that examine this method, but some studies examining the flip itself do exist in the literature.

Most of the studies found on the flipped classroom model in undergraduate education were in science, biology, algebra, and mathematic fields. This is not surprising since these are the subjects which are most commonly flipped (Overmyer, 2013). Students in introductory biology taught at the University of California were taught using “learn before lecture” techniques between 2007 and 2009 (Moravec, Williams, Aguilar- Roca, O'Dowd, 2010). The researchers did not use the term “flipped” or “inverted”, but the methods had similarities. Their method was quite basic, and simply involved removing 4 or 5 lecture slides from the previous year's lectures and creating narrated PowerPoint videos. One of their concerns was that teachers of large introductory classes at research universities have little interest in making major revisions to their courses.

Instead of a complete modification of the course, they created pre-class assignments that combined narrated video with note taking sheet. The school was interested in implementing higher-level concepts during engagement exercises already scheduled into the class, but did not want to have to create additional lab sections. The course designers stated: theoretically, this could be accomplished by students completing assigned readings before class but in our experience this rarely occurs, even when coupled with pre-class quizzes worth a small number of points. We therefore created pre-class assignments designed to help students learn knowledge-level material in preparation for lecture. (Moravec et al., 2010, p. 3). The intervention group consisted of students who received the pre-class video assignments in 2009 and the control group was classes from 2007 and 2008, before the pre-class video assignments. The measure of learning was related question pairs, matched by level and format. The mean increase in performance was 21%, and the percentage of students who correctly answered five of six exam questions was significantly higher ($p<.001$) in 2009 versus the previous years.

Another study compared students‟ course achievement in computer literacy at Uludag University in Turkey. The research used two instructional methods. The first method was a traditional face-to-face lecture and the second method was a blended model that had some similarities to a flipped learning format. The research used a pretest-posttest model with a control group/intervention group design. The participants were assigned to groups purposefully to achieve group equivalency, based on test scores examining prior knowledge about computers. The face-to-face group had two hours of traditional classroom time and two hours of applied laboratory material per week. The traditional class time was not just lecture, but included classroom discussions, projects and collaborative learning. The blended classes only meet face to- face for two hours per week. This differs from a flipped classroom model, where face-to-face time is not changed from the traditional model. However, similar to a flipped model, the blended classes had a website that provided multimedia components, such as screencasts, assessment simulations, and online tutorials. The achievement test consisted of questions from the courses final exam and was also used to test students" prior knowledge as the pretest. The same exam was given as the pretest and the posttest. The test was prepared by four instructors of the course. The course ran for fourteen weeks with 86 students finishing the blended model and 93 students taught in the traditional model. An independent samples t-test was applied to the mean posttest scores to examine the differences in course achievement. There was a statistically significant difference, $t(177) = 6.913$, $p < .001$, with the blended group outperforming the strictly face-to-face group.

The research compares student' achievement between a traditional pharmacy course from 2011 and a flipped classroom based course in 2012. For the 2012 course, students viewed vodcasts of lectures prior to the scheduled class and then discussed interactive cases of patients in class. For each class, an activity was developed and implemented that supported and provided application of the material contained in the previously viewed vodcast lectures. The same instructor taught the courses in 2011 and 2012 and covered identical material and gave identical final exams. The final exam consisted of 16 multiple choice questions. A t-test was performed to analyze differences. It was found that the flipped class in 2012 performed statically significantly better than the traditional 2011 class with $p = 0.024$ (Pierce & Fox, 2012).

Student's perceptions of the flipped classroom were also explored. A ten question Likert scale survey instrument was administered. Results showed that 90% percent of the students agreed that the instructor made meaningful connections between the topics in the vodcasts and the class activities. Likewise, eighty percent agreed that the flipped model improved their self-efficacy and improved their confidence on the final exam. Nearly two-thirds expressed a desire for more instructors to use the flipped classroom model. The study concluded that the flipped model improved student performance and perceptions and felt that the contributing factors included student contact with the material prior to class (the vodcasts), frequent and formative assessments prior to the final exam, and interactive and group-based class activities (Pierce & Fox, 2012).

A similar study reported on an implementation of the flipped classroom of three sections in an IT 101 (Introduction to Information Technology and Computing Concepts), an introductory IT course required by all first year students at a small business university (Frydenburg, 2012). The course covers digital literacy topics, basic web development, maintaining laptops, wireless networking, and current web trends. Approximately 40% of the course covers topics in Excel spreadsheet software, and this was the only part of the course flipped. Before implementing the flipped model, the instructor would explain Excel concepts in class, or demonstrate a tutorial from the textbook during class, as students tried to follow along on their laptops. They would then go home to complete the mastery exercises. In implementing the flipped classroom, the students watched the instructional videos before class, and there were no in-class demonstrations or lectures. Students would work on completing an in-class group activity with the instructor readily available to complete the exercises. Classes met in 75- minute blocks with five minutes for announcements, five minutes for a quiz based on the videos, five minutes to explain the in-class activity, 45 minutes to complete the activity, and 15 minutes to debrief and have groups share their solutions. The researcher asserts that this created an active learning experience where students engaged in open-ended and learner-centered activities, collaborative problem solving and required public articulation of the concepts with the group sharing.

To confirm and access if students watched and retained the content of the videos, a five minute, five-question multiple choice quiz was delivered in class. Students completed the quiz by logging onto the Blackboard learning management system online. The study did not state if the students were required to bring an Internet accessible device to class, or if the classroom had a one-to-one computer. The researcher states that the quizzes motivated students to watch the videos, as each quiz counted toward the course grade. To determine the impact of flipping the course, the author administered a voluntary online survey to all 66 students. There was no control group, and the research does not measure student achievement. All three sections were taught by the same instructor. Since there was no experimental design, all of the outcomes were descriptive. Over 90% of the students felt that the flipped classroom helped them learn the material better than a traditional classroom. Likewise, over 90% of the students agreed that the structure of the course made the class more personal and helped them connect with other students. The videos made by the student tutors were well received by the class with a strong majority responding that the videos were clear and short enough to convey the concepts. The only negative reported in the surveys was in the large lecture section. Students responded that the class was too big for one instructor to facilitate and groups had to wait too long for assistance. The article states that smaller class size and a classroom with tables rather than rows of fixed seating is more conducive for implementing a flipped classroom and the ability for the instructor to circulate among the students is crucial.

Some studies have focused on the effect of the flipped classroom on knowledge gains. So called Just-in-Time Teaching (Novak, 2011) is an inverted classroom approach where such an analysis has been made. Students complete web-based pre- instruction assignments before coming to class and the instructor uses their responses on these assignments to mold the classroom time to the needs of the students, facilitating group discussion or problems solving as he or she sees fit. The value of this method has been shown by a study conducted by Formica, Easley, and Spraker (2010). They examined the performance of 222 students in introductory physics courses taught over five years and compared traditional lecture styles to Just-in- Time teaching methods for Newton's Third Law. Dramatically better knowledge gains using the FCI were measured with the Just-in- Time teaching methods.

Though they call the method Learn before Lecture, Moravec, Williams, Aguilar- Roca, and O'Dowd (2010) examine the effectiveness of the inverted model on a large college level introductory biology class and also focused on student knowledge performance. Two methods of delivering the lecture content in a flipped format were used: a take home worksheet and a narrated PowerPoint video. Participatory exercises such as interactive demonstrations and conceptual discussion questions were used in class for both methods. Both methods were found to be significantly more effective when compared to sections taught in the two years prior to the study where traditional methods were used.

Bate and Galloway (2012) present a case study looking at the effectiveness of the flipped model on a large enrollment introductory physics class at the University of Edinburgh. For their study, the flipped model was implemented using a combination of self-made course materials, assigned readings and web-based resources in place of traditional lecture with guided discussion and peer instruction using a classroom response system taking up the time in class. The focus in the flipped model was on a creating a participatory discussion with the class, rather than an instructor presentation to the class.

The authors address the possibility that student attendance could possibly decrease dramatically when essentially all the course information is provided outside of class, but found that attendance remained fairly constant throughout the course. Pre/posttest gains were measured and demonstrated a significant increase in student knowledge. However, no direct comparison to a non-flipped class covering the same material to similar students was made. It is entirely possible that these students would have achieved just as much of an increase in physics knowledge through any instructional method.

A more scientific examination of the flipped classroom directly comparing similar groups such as the quasi-experimental study by Davies, Dean, and Ball (2013) can offer much more insight. In this study traditional instruction methods were compared to two slightly different technology driven inverted models, one utilizing primarily software and the other primarily videos. The study was focused on an introductory spreadsheet class taught at Brigham Young University. They found that there was no significant difference between the traditional method and the video based inverted model. Both were found to be more effective than the simulation based approach as measured by a pre/posttest. This non-significant result highlights how there is as yet no real consensus regarding the effect of the flipped classroom on actual learning. But there are factors beyond knowledge to be considered when considering the flipped classroom. Attendance, student perception and engagement are also important factors.

**Theoretical Base for the Flipped Classroom**

Theories in the broadest definition stem from observations (Sternberg, 2008). A theory should have four basic criteria. Good theories have conceptual definitions and domain limitations, build relationships, and help make predictions. Good theory is important as the theory aides in explaining and solving real-world problems. Sternberg (2008) posited that one of the greatest challenges facing modern educational research is formulating and testing broad theories that can be applied across many disciplines.

**The Constructive Learning Theory as Basis for the Flipped Classroom**

Constructivism has emerged as a powerful theory for explaining how humans learn about the world around them and how new knowledge is formed (Felder, 2012; Gordon, 2008; Neo & Neo, 2009; Nie & Lau, 2010; Prakash, 2010). The theory of constructivism is that knowledge is not waiting to be discovered but rather it is constructed by humans by interaction with the world and with each other (Felder, 2012). Grounded in insights of theorists such as Vygotsky, Piaget, and Freire, constructivism has shifted the paradigm of understanding how knowledge is gained and internalized (Felder, 2012; Gordon, 2008). Vygotsky (1978) conceptualized a "zone of proximal development" which enabled researchers to realize that social and cultural contexts influence human development, learning, and knowing. Piaget (1972) posited that the path to gaining knowledge is equally or more important than the result of knowledge gained. Knowledge is not something that individuals either possess or lack. Rather, knowledge is gained when individuals interact by exchanging ideas, articulate problems, and develop meaningful ways to make sense of the problems (Yang & Wu, 2012). Further, this co-construction of knowledge leads to enhanced problem solving and idea-making (Felder, 2012).

Learner collaboration, interaction, and engagement are foundational in the constructivist theory of learning (Prince & Felder, 2007; Sjober, 2007). Collaborative, interactive activities have been touted to be most effective at helping students reach a higher level of understanding (Menchaca & Bekele, 2008; Merrill, 2008; Neo & Neo, 2009; Sorden, 2011). It suggested that students in the constructivist learning environment acquire more varied knowledge and are able to apply knowledge to real-life situations. The learner develops new ideas and alters existing ideas when interacting with content and collaborating with other learners and the instructor (Felder, 2012; Prince & Felder, 2007; Prakash, 2010).

One of the more important core ideas that constructivists claim is that "knowledge is actively constructed by the learner, not passively received from the outside. Learning is something done by the learner, not something that is imposed on the learner" (Sjober, 2007, p. 3). Over the past years, educators have sought methods for applying the constructivist theory to the classroom (Sternberg, 2008). Researchers have developed a variety of instructional models to apply constructivist learning theory (Lasry, Mazur, & Watkins, 2008; Wijnia, Loyens, & Derous, 2011). Constructivist learning environments such as problem-based learning (PBL), Peer Instruction (PI), inquiry-based learning through gaming, and most recently, the flipped classroom, have been applied in the classroom (Felder, 2012; Mazur, 2009; Wijnia et al., 2011; Yang & Wu, 2012).

Problem-based learning. Problem-based learning is an inductive teaching method where students generally work in teams to solve ill- structured or open-ended problems (Araz & Sungar, 2007; Donnelley, 2012; Prince & Felder, 2006; Wijnia et al., 2011). Problem-based learning can be implemented in various disciplines of higher education where application of concepts is a goal (Prince & Felder, 2007). Such disciplines include health sciences, engineering, business, education, law, natural sciences, and computer-related fields. Students work together in the role of student and instructor while taking responsibility of the learning (Martin et al., 2008). Problem-based learning affords opportunities for self-directed learning through collaboration and problem-solving (Donnelley, 2012). Prince and Felder (2006) opined that learning environments influence students' motivation and self-regulated learning. However, problem-based learning was found to be the most difficult for teachers to implement and students were most resistant to this method of learning (Prince & Felder, 2006).

Problem-based learning is not a native learning process for students (Araz & Sungar, 2007; Donnelley, 2012; 2012; Prince & Felder, 2006; Wijnia et al., 2011). The transition from traditional learning environments that are teacher-centered to student-centered learning environments is challenging for many students and instructors (Donnelley, 2012). Students express shock, frustration and resistance to PBL at the onset of implementation. Students have difficulties determining how to gain prior knowledge and determining what concepts are important (Donnelley, 2012). In a meta-reflection study over a seven-year period of PBL implementation in an undergraduate chemical engineering course, Harun et al. (2012) concluded that motivation from the facilitator and a scaffolding approach to PBL implementation helped ease student frustration and resistance to the student-centered learning environment.

Motivating students to engage positively in the PBL environment is essential in PBL implementation and ensures that the "richness of PBL is achieved" (Harun et al., 2012, p. 234). The key is to move students to become mastery oriented learners as opposed to performance oriented learners (Martin et al., 2008). The facilitator can help with this transition by focusing students on the learning process and the importance of the task (Harun et al., 2012; Overbaugh & Nickel, 2011). The facilitator can implement several practices that can help motivate students in a PBL learning environment. These key practices are: 1) setting course goals, 2) students setting personal course goals, 3) capitalizing on students' interests and background knowledge, 4) use relevant materials, 5) model skills of independent learning, and 6) provide timely feedback (Harun et al., 2012; Overbaugh & Nickel, 2011).

Constructivist learning puts the student in the center of the learning process, therefore, the students‟‟ individual characteristics affect the learning (Baeten et al., 2013; Hill, 2013). Harun et al. (2012) opined that in order for PBL to be successful, students' level of motivation towards learning is essential. Learner autonomy is correlated with high quality motivation (Hill, 2013; Lavansani & Ejei, 2011; Vos et al., 2010; Wijnia et al., 2011). Intrinsically motivated learners are mastery oriented and exhibit deep learning whereas extrinsically motivated learners are focused on performance outcomes and exhibit surface learning (Ryan & Deci, 2000). In order for PBL to be perceived as fun and beneficial, the facilitator must encourage students to develop intrinsic motivation and adopt mastery learning processes (Harun et al., 2012; Prince & Felder, 2006).

Good course design and learning activities are essential in maintaining and moving students toward intrinsic motivation (Harun et al., 2012; Vos et al., 2010; Wijnia et al., 2011). While Harun et al. (2012) determined that the facilitator has a major influence on whether the PBL environment promoted intrinsic motivation; other factors were found to be motivating and de-motivating in a PBL environment. Wijnia et al., (2011) found that the PBL students scored higher on competence but that there was no significant difference in autonomous motivation between the PBL and traditional lecture groups. Active learning in the form of collaborative activities was perceived as motivating (Harun et al., 2012). However, controlling aspects of both PBL and the traditional lecture environments, such as mandatory attendance and uncertainty in instructional expectations were found to be detrimental to student motivation (Wijnia et al., 2011). Further, researchers found that de-motivating aspects stemmed from a lack of content knowledge necessary to engage in the PBL environment (Araz & Sungar, 2007; Donnelley, 2012;). Implementation of e-learning technology could leverage the knowledge required for students to take full advantage of PBL (Donnelley, 2012; Neo & Neo, 2009; Roberts, 2010).

Harmonizing technology with the PBL environment is challenging for many instructors in higher education (Donnelley, 2010). Many faculty view technology as a necessity in teaching and learning, but few faculties realize the affordances of e-learning technologies in a PBL environment (Donnelley, 2010; Neo & Neo, 2009). There are several technology tools that enhance success in the utilization of technology in a PBL environment (Donnelley, 2010). Podcasting was found to be one of the most useful e-learning tools to enhance the PBL environment (Neo & Neo, 2009). Podcasts were found to be beneficial due to the replacement of the typed word with voice recordings and visuals that provided differentiated delivery of content. Donnelley (2010) suggested that more research should be conducted to provide a basis for choosing specific technologies and how to use these technologies to achieve specific outcomes.

**Peer Instruction:**

Peer Instruction (PI) is a student-centered learning environment where information transfer occurs outside the classroom so that active learning can take place in the classroom (Mazur, 2009). Schell (2012) suggested that PI encouraged students to engage with subject matter before class so that F2F class time can be spent uncovering misconceptions and confusion about the concepts. Like PBL, PI can be implemented using various methods (Prince & Felder, 2006; Mazur, 2009). One method is to engage students with subject manner through textbook readings prior to the F2F class in preparation for collaborative questions and discussion. Peer Instruction utilizes a modified traditional F2F lecture to include questions that students answer as part of a group (Mazur, 2009; Schell, 2012). As an incentive to complete the textbook readings, a variety of methods which included reading quizzes, short summaries, and free response to questions were employed (Moss & Crowley, 2011; Schell, 2012).

Student test scores increased significantly in the PI environment compared to the traditional lecture learning environment (Mora, 2010). However, when implemented in a science course, non-science students were more dissatisfied with PI than students majoring in a science discipline (Mazur, 2009). A subsequent modification of PI using personal response systems (PRS) resulted in e-learning technologies which provided methods for assessing pre-class knowledge acquisition (Mazur, 2009; Schell, 2012). With advances in e-learning technologies PRSs or "clickers" were used to assess the extent of knowledge acquisition outside of class (Schell, 2012). At the beginning of class, students were given the opportunity to clarify misconceptions and formulate new ideas and skills in a discipline. In addition to using PRSs, Mazur (2009) developed Concept Tests which consisted of prepared questions that are posed to students to assess learning outside of class. Students were given the opportunity to reflect on the question, provide an answer using the PRS, discuss their answers with peers, and again provide an answer using the PRS (Mora, 2010). This format of self- reflection and clarification is enhanced with the use of technology and provides a means for assessing gained learning outside of class (Mazur, 2009). Using data obtained from PI colleagues worldwide, Mazur (2009) determined that learning gains nearly tripled and problem-solving skills improved with this learner-centered approach.

**Educational games and digital storytelling:**
Traditional lecture learning environments deliver content from the instructor to the learner where the learning is considered passive (Nie & Lau, 2010). Problem-solving and critical thinking skills seldom evolve in the teacher-centered environment (Yang & Wu, 2012). With the availability of emerging technologies, the ability for students to learn collaboratively and through personal learning experiences has increased dramatically (Martin et al., 2008). Educational games and digital storytelling (DST) have emerged as a practical application of the constructivist learning environment (Yang & Wu, 2012). Not only do students actively participate in the learning process, students gain 21st century skills such as team work, information literacy, and collaboration through technology Further, educational games and DST can enhance learning by providing alternate means of knowledge acquisition, increase critical thinking skills, motivation, and information literacy (Vos et al., 2011; Yang & Wu, 2012).

Methods for practical applications of constructivist learning have been difficult to implement (Koohang et al., 2009). Learning is enhanced when a student plays an active role in the making of a game or story (Neo & Neo, 2010). Researchers found that the game-playing and DST positively influenced academic achievement, critical thinking, and learning motivation compared to the traditional learning environment (Neo & Neo, 2009). Further, the collaborative approach to problem- solving, creativity, and goal-orientation fostered self-efficacy and satisfaction with the learning experience to a greater extent than the traditional lecture learning environment (Yang & Wu, 2012). Researchers provided evidence for a practical application of constructivism through the use of technology. However, the implementation of digital storytelling and game-making might be difficult for students and faculty who have little digital media experience (Yang & Wu, 2012). Multimedia such as pod- and vodcasts are used regularly by many students and instructors and may be an easier application to promote constructivism (Donnelley, 2010).

**Self-Regulation: Definition, Dimensions, And Models**
Self-regulation plays a central role in one of the most topical issues facing education researchers: explaining variability in academic achievement. In fact, good self-regulation has been found to protect disadvantaged students from academic failure and predict academic success better than intelligence (Duckworth & Seligman, 2005; Raver, 2012; Ursache, Blair, & Raver, 2012). Despite the importance of self-regulation in academic and other domains of, a clear picture of its precise impact has yet to emerge from the empirical literature. In particular, different disciplinary approaches have produced a diverse body of research hindered by inconsistent definitions and findings (Jurado & Rosselli, 2007; McClelland & Cameron, 2011). The considerable variation in conceptual and operational definitions of self- regulation can be attributed to its place at the intersection of several research domains, each with their own paradigms, and terminology and scopes (Berger, 2011; McClelland & Cameron, 2011). As a result, the scope and interdisciplinary nature of self-regulation has produced almost as many ways to define this construct as there are programs of research devoted to it (Hoyle & Davisson, 2010). Conceptual variation often reflects important constructs being labeled, defined, and measured the same way or from the same constructs being labeled, defined, and measured differently. If researchers are referring to the same underlying construct with different labels, for example, then it is more difficult to identify common ground between them. Two programs of research could be exploring the same phenomenon with different results, but these discrepant findings would not inform theory building or revision if conceptual overlap is obscured by inaccurate labels. If researchers use the same label to denote different underlying constructs and consequently uncover different effects, this could create the false impression of inconclusive findings. As a result, an effective after-school program could be defunded or an ineffective teaching practice could be implemented based on confused evidence.

In the context of an educational setting, academic self-regulation is thought to be an integration of the meta-cognitive, behavioral, and motivational dimensions in order to achieve a specific educational goal, such as writing a paper or preparing for a quiz (Zimmerman, 1998a). Zimmerman (1989a) defined academic self- regulation in a general sense as the extent to which learners are meta-cognitively, motivationally, and behaviorally active in the attainment of their own learning goals. Specifically, academic self- regulation can be defined as “an active, constructive process whereby learners set goals for their learning and then attempt to monitor, regulate, and control their cognition, motivation and behavior, guided by and constrained by their goals and the contextual features of the environment” (Pintrich, 2000, p. 453).

**Academic Self-Regulation**

Zimmerman (2002, 1989a, 1989b) has pointed out that academic self-regulation models are both distinctive in their own right and highly useful for explaining academic study. They are distinctive because their objective is to understand academic studying from the learner's perspective. They are useful in learning research because they are multi- dimensional, including self-motivation as well as metacognition and behavior performance. Self- regulatory learning models shift the research focus from student learning abilities and environments as fixed traits to the individual student's personally initiated strategies directed at improving learning environments and performances. Indeed, as Zimmerman (2002) has noted, academic self- regulation may be viewed as a means for learners to compensate for their individual differences in learning.

Zimmerman's perspective emphasizes the trend in modem conceptions of self-regulation to stress process as opposed to trait or entity notions of self-regulated learning (Stajkovic and Luthans, 1998). This trend is evident in most theoretical models of self-regulation and results in dynamic, process- oriented explanations of learner self-regulation. However, despite general agreement on process approaches to self-regulation, diverse theoretical/philosophical approaches and perspectives of self-regulated learning do exist and they do differ in identifying precisely which processes comprise the self-regulatory system. As mentioned, there are a variety of self-regulated learning models that employ a variety of constructs and processes (Boekaerts & Niemivirta, 2000). Pintrich (2000) proposed a general framework for self-regulated learning that incorporates four basic assumptions shared by most models of self-regulated learning. He termed the first the "active, constructive assumption" (p.452). This suggests that learners are not passive recipients of knowledge, but rather are active, participants in their own construction of meaning during the learning process. Learners set their own meanings, goals, and strategies based upon information from both the external environment as well as from information in their own minds. The second common assumption proposed by Pintrich is the "potential for control assumption" (p. 452). Most self-regulated learning models assume that although various constraints may limit individual attempts to self-regulate, learners do have the potential to monitor, control, and regulate at least some elements of their cognition, motivation, behavior, and environment. Pintrich's third encompassing assumption is the "goal criterion, or standard assumption" (p. 452). Most self-regulated learning models assume that there is a goal or standard against which self-regulated learners measure performance in order to determine whether to continue or to alter their learning behavior. The fourth assumption common to most models of self-regulated learning is that self- regulatory activities function as mediators between actual performance and personal and contextual aspects. This means that the self-regulation of cognition, motivation, and behavior is directly linked to performance outcomes by mediating the relationships between outcomes and personal and environmental characteristics.

**Social Cognitive Self-Regulation Theory**

Bandura (1986) proposed a social cognitive, as opposed to a behavioral or purely cognitive, approach to self-regulation when he rejected the notion that people are driven by vague inner forces or automatically controlled by external stimuli. Rather, he proposed a model of triadic reciprocality whereby individual behavior, cognitive and other personal factors, and environmental factors all function as interacting determinants of each other. This model incorporated cognitive factors, but avoided the "strict cognitivism" common during the 1970s by also recognizing the roles played by behavioral and environmental factors as critical determinants of human thought and action (Bandura, 1995). Bandura (1986) emphasized, however, that human beings had also personal control over their own functioning when he argued that they are capable of being self-directive and of exercising some measure of control over their thoughts, feelings, and actions. People can structure their behavior to produce the consequences they desire and at the same time adjust behavior based upon the consequences created by that behavior. From a social cognitive learning perspective, therefore, academic self- regulation is composed of cognitive, motivational, affective, and social (environmental selection) processes that interact, in terms of learning, as important determinants of academic achievement.

Bandura (1997) specifically emphasized the potential for and importance of learner control in online learning. This sense of control derives from an individual's sense of personal efficacy for specific learning tasks. As Bandura noted, online learning has the potential to afford learners a high degree of personal control over their learning. Such control is not, however, a condition of online learning. It is a function of a number of factors including mode of delivery, design of instruction, institutional orientation, and, most importantly, learner perceptions (Doherty, 1998). Bandura also stressed the importance of learner self-regulation as a highly significant factor in learner success or failure in online learning contexts. The ability of learners to regulate and direct their own learning is an important determinant of performance in any learning context; however, it is of even greater significance in distance learning contexts where the extrinsic support structures typical of classroom-based learning are absent (Schunk & Zimmerman, 1998).

**Zimmerman's Dimensions of Academic Self- Regulation**

Zimmerman (2002) has drawn on Bandura's work to develop an expanded, comprehensive social cognitive approach to academic self-regulation. Zimmerman (1998b, p. 1) pointed out, the self- regulation of learning permits learners to become "controllers rather than victims of their learning experiences." Self-regulated learners are proactive rather than reactive; they develop and maintain a controlling interest in both the selection and strategic attainment of their learning goals and activities. Zimmerman also importantly distinguished self-regulation from fixed mental abilities such as intelligence, noting that it "is the self-directive process through which learners transform their mental abilities into academic skills" (1998b, p. 2). Therefore, while mental ability may well be fixed trait, how effectively a learner uses her mental ability is not fixed, but rather is adjustable to enhancement through self-regulatory processes.

In 1989 Zimmerman proposed a social cognitive triadic theory of academic self-regulation, defining self-regulated students as those who are "meta- cognitively, motivationally, and behaviorally active participants in their own learning process" (Zimmerman, 1989a, p. 329). He later defined self- regulation itself as "self-generated thoughts, feelings, and actions that are planned and periodically adapted to the attainment of personal goals" (2000, p. 14). In this view, self-regulation is influenced by the reciprocal interaction of personal, behavioral, and environmental processes. Self- regulated learning is present to the extent that learners are able to intentionally employ personal (self) processes to manage thought, emotion, and behavior during learning, as well as the context in which the learning occurs. Each element of the process - personal, behavioral, and environmental – provides information that feeds back upon the other elements of the process, enabling strategic adaptation of thought, emotion, action, and context in the on-going process of goal attainment.

Zimmerman (1998a), working within the framework of social cognitive learning theory, has presented a conceptual framework of academic self-regulation that consists of six underlying psychological dimensions that learners can self- regulate by employing specific processes. The psychological dimensions of academic self- regulation in Zimmerman's model are motive, method, time, behavior, physical environment, and social. As Zimmerman contends, the advantage of a multidimensional perspective of self-regulation is that it corrects previous perspectives that viewed it as a unitary trait construct. These dimensions are interdependent and can change over time and experience. In Zimmerman's framework, each psychological dimension of self-regulation entails specific task conditions, self-regulatory attributes, and self-regulatory processes.

**Learning autonomy**

Zimmerman (1994) argued that personal choice and control, or autonomy, are a defining condition for self-regulation. They are essential elements for the successful exercise of self-regulation. In a later article, he made the same point with equal force when he noted that "students cannot develop or display their self-regulatory skill in settings where they cannot exercise personal choice or control" (Zimmerman, 1998b, p. 11). The emphasis on personal choice and control, important elements of learner autonomy, in the development and use of self-regulatory skills, therefore, is a critically important one.

**The motive dimension**

The motive dimension of self-regulation addresses the question of why learners choose to learn, i.e., their motivation for learning (Eccles & Wigfield, 2002). The task condition in Zimmerman's (1998a) scheme is that learners choose to participate. The self-regulatory attribute here is that the learner is self-motivated. The self-regulatory processes involved are self-efficacy and goal setting. Motivation precedes learning and without it learning will not take place. Choice is an essential aspect here since, as Zimmerman has argued, "to be able to self-regulate, students must be free to and capable of choosing whether and how much to study" (1998a, p. 74). In traditional classroom-based settings, this freedom to choose "whether and how much to study" is normally characteristic of homework and out-of-class projects. In online learning, however, choice is generally characteristic of all aspects of distance study, from the initial decision to study at a distance to course selection to completion and submission of course assignments. The characteristic attribute of this dimension is that learners are self-motivated, or intrinsically motivated.

**The method dimension**

Method dimension of self-regulation addresses questions relating to how learners self-regulate their learning. The task condition involves learners choosing their own methods. The self-regulatory attributes consist of employing methods that are consciously planned or else have become automatized through practice. The self-regulatory processes employed by self-regulated learners are task strategies, imagery, and self-instruction. Again, as Zimmerman (1998a) pointed out, choice of method is essential if learners are to self- regulate how they learn. Highly self-regulated learners will plan their learning strategies based upon an analysis of the requirements of the specific task. With regular use strategies may become automated and thus not require conscious planning.

**The time dimension**

The time dimension of academic self-regulation addresses questions relating to when and for how long to study. Learners who are self-regulated plan how they use their time more effectively and efficiently than learners who do not self-regulate. They employ time management techniques in order to complete assignments in a timely and efficient manner.

From a social cognitive perspective, time management is influenced by personal, behavioral, and environmental factors. Personal factors include self-efficacy perceptions, goal setting, and attributions. Behavioral factors include efforts to self-observe, self-evaluate, and self-react. Environmental factors include the use of study aides such as watches, clocks, alarms, and appointment books. As Zimmerman, Greenberg, and Weinstein (1994) noted, the importance of time management is context dependent. Some tasks may be time independent. Others, and online learning fits this category, are time dependent. Therefore, the ability of online learners to effectively self-regulate their use of time through planning, self-monitoring, and self-adjusting is critical to their success. The autonomy dimension of online learning entails an essential need for online learners to be effective time managers. Whether an online learning course is delivered synchronously or asynchronously, successful learners must manage the time requirements of the course such that the work is completed in a timely and efficient manner. Since most online learning learners are adults or young adults with life responsibilities, their ability to manage competing demands on their time is critical to their online learning success.

**The behavior dimension**

The behavior dimension of self-regulation addresses questions relating specifically to explicit performance, or what learners do in pursuit of their learning goals. The element of choice is essential with this dimension as well, since in order to self-regulate, learners must be able to freely adapt their behavioral responses based upon the feedback their initial learning behavior generates. The primary attribute associated with this dimension is self-awareness. Self-regulated learners are aware of the learning outcomes they expect (have set for themselves), are sensitive to not having achieved those outcomes (if such is the case), and are able to adjust their behavior accordingly in order to make up for any behavioral deficiency in attaining their learning goals. Self- regulated learners adjust their learning behavior in response to performance feedback (Zimmerman, 1998a). Successful online learners, as has been discussed, largely choose their own learning goals and self-monitor and self-evaluate their learning performance, being able to effectively adjust their behavior based upon the feedback they receive.

**The physical environment dimension.**

The physical environment dimension of self- regulated learning addresses questions related to where learners learn and which instructional supports they employ (Zimmerman, 1998a). Self- regulated learners are proactive in choosing where they will study. They are sensitive to their environment and resourceful in altering or changing it as necessary. The autonomy of online learners ensures that they have a great deal of choice of where they study, since they are not anchored to classrooms. Online learning learners generally (although not always) have the option of accessing their courses via computers at home or elsewhere (e.g., library or computer lab). If they are working on a personal computer at home, they have the option of which room that computer is situated in - a place of quiet such as a den or bedroom, or a louder more distracting environment, such as a living room or kitchen. If online learners are unable to structure their learning environment at home, i.e., have the computer placed in a quiet room, they can access their course from a university or public library computer. Self-regulated online learners will take appropriate steps to ensure that they have regulatory control over their learning environment. This may mean studying at a time of day when other family members are out or asleep or it may mean going to a university or public library and using the computers there. It also means that online learners will ensure that they have access to the equipment they require in order to study effectively.

**The social dimension**

The social dimension of self-regulation refers to those questions centered on with whom the learner studies (Zimmerman, 1998a). Self-regulated learners are aware of the important role other people can play in their learning. They are able to identify those people who can assist them and contribute to the attainment of their learning goals. At the same time, they are also aware of those people who can detract from their attainment of their learning goals. Self-regulated learners know how and from whom to seek help when they encounter learning problems and obstacles. As has been indicated above, successful autonomous online learners are able to seek appropriate learning help from others, instructors or classmates, as necessary. Since an element of online learning is social isolation from classmates and instructors, online learners need to be proactive in employing the technology, through e- mail, chat rooms, bulletin boards, as well as occasional face-to-face meetings, to lessen the social distance involved in their learning situation. Henderson and Cunningham (1994) argued that effective use of instructional technology systems requires that the learner be sufficiently motivated and self-regulated to effectively and efficiently utilize the features of the technology. In an online learning context this means that learners either have or mindfully develop their skills in using the specific elements of the technology that permit interaction with other learners and with instructors. In terms of help seeking, Newman (1994) noted that it is a key way that self-regulated learners exercise control over the learning process in order to achieve their learning goals. Rather than simply stew in their own frustrations, self-regulated learners take action to focus and target their help seeking requests in order to overcome any frustrations they encounter in meeting their objectives.

**Sense of Community in Classroom Environments**

Researchers and scholars discussed the direct importance of the social environment in motivational development. For example, Martin and Dowson (2009) suggested that a positive social relationship with people who are important to the students helps students develop and maintain their motivation. They pointed out that a positive relationship with others provides the students access to the necessary help for the learning activities and helps their social and emotional development, which are important in regulating themselves in a social environment. Hickey (1997) assumes that motivation is constructed in a social context through activities such as collaboration and negotiation. He emphasized the need to research instructional designs based on the social- constructivist view. Järvelä, Volet, and Järvenoja (2010) supported this claim by saying that motivation is cognitively developed within an individual, while also actively constructed by an individual through interactions with the external social environment. Järvelä, Järvenoja, and Veermans (2008) conducted a study on collaborative learning with 99 college students who were either in a face-to-face or a virtual learning environment. Based on the self-reported questionnaires and the video-based observations, the authors found that the students considered a social environment to be an important factor in regulating their own motivations. These studies showed that the connection between social relationships and motivation has been accepted extensively throughout the research community.

One measure that commonly has been used to evaluate the quality of a social environment is the sense of community that a person feels within a larger group of people. A sense of community is often defined as "[a] feeling that members [of the group] have of belonging, a feeling that members matter to one another and to the group, and a shared faith that the members' needs will be met through their commitment to be together" (McMillan & Chavis, 1986, p. 9). The authors claimed that a sense of community consists of four components, i.e., membership, influence, reinforcement, and emotional connection.

Membership is a feeling of belonging in which a person identifies himself as being part of a group. A feeling of membership evolves through the development or identification of a boundary that separates a person's group from the others. Influence is the recognition of a person's own influence over the group's activities or its identity, and, conversely, the group's influence over his action or identity. Reinforcement is a feeling of fulfillment provided by the community that satisfies a person's needs in some form, such as status or competence. Shared emotional connection is an association established by sharing an experience, such as having many interactions, sharing positive experiences, finalizing an event, committing to a shared cause, giving compliments or humiliation. Blanchard (2007) applied McMillan and Chavis (1986) sense of community framework to online spaces by proposing the Sense of Virtual Community Measure (Blanchard, 2008), which allows researchers to assess the sociocultural mental state of online users. Their study confirmed that sense of community exists in online environments.

The previous research has shown that a sense of community among students in a classroom brings several benefits to the students as well as to their classroom. For example, Goodenow (1993) conducted a study with 353 secondary school students to investigate how the relationship between classroom belongingness and support was related to their academic achievement and motivation. The results showed that academic motivation and achievement were strongly related to the students‟ sense of belonging. Vieno, Santinello, Pastore, and Perkins (2007) analyzed international survey data of 7,097 students who were between the ages of 11 and 15 concerning their health related behaviors, and they found that a sense of community in schools was related significantly to self-efficacy. They also reported that those who experienced a sense of community had a sense of support from their family and friends; and therefore, they maintained their well- being. Freeman, Anderman, and Jensen (2007) also studied the role of belongingness in both classrooms and schools and found that the sense of belonging was associated with academic achievement and satisfaction. The study also suggested that specific characteristics of instructors were associated strongly with the growth of intrinsic motivation. Other studies reported that support for building a sense of belonging to a community helped the students who were members of an ethnic minority to overcome difficulties in academic activities (Walton & Cohen, 2007). These studies demonstrated that a sense of community in academic settings is associated with several positive outcomes.

As scholars started to study the sense of community in social loafing environments (Abfalter, Zaglia, & Mueller, 2012; Forster, 2004), the positive contributions of a sense of community were observed in online spaces. For instance, Rovai (2002) conducted a study with 314 undergraduate students in asynchronous online courses using a course management System-Blackboard. The results showed that the feeling of connection among students was related significantly to their cognitive development and participation. Drouin (2008) investigated 71 undergraduate students in online courses that used asynchronous discussion and e-mail as communication channels. Although the results were mixed, there was a significant relationship between students‟ satisfaction with the course and the perceived sense of community. Although some studies have shown that a sense of community did not affect students‟ participation (Woods, 2002) and others have shown that it was associated with a lower completion rate (Grandzol & Grandzol, 2010), there is still overwhelming evidence that a sense of community is a very promising construct that should be considered in designing instructional materials and environments.

Despite the high expectations of educators and researchers, social integration has been considered to be difficult to achieve in the online classroom environment (Muilenburg & Berge, 2005; Song, Singleton, Hill, & Koh, 2004). Some researchers have concluded that the questionable quality of communication in the online environment impedes users from constructing intimate relationships by filtering out several of the social cues that exist in face-to-face interactions. Even though some researchers found that users construct close social relationships using computer-mediated technologies, learners have been reported to experience isolation or difficulties in constructing social relationships (Hara & Kling, 2000). For example, based on a pilot study they had completed, Muilenburg and Bergem (2005) conducted a survey of a smaller number of participants about barriers in online classroom environments. They collected 1,056 responses that indicated that the most critical barrier for learners in online classroom environments was the lack of social interaction. A study conducted by Vonderwell (2003) supported this finding. In the qualitative study of 22 college students in an online course, most of the students reported that the online environment made person-to-person interactions difficult and that they were hesitant to send an e-mail to anyone whom they did not know beforehand.

Accordingly, much effort has been made to explore how to promote a sense of community in online classroom environments. For example, Dawson (2006) conducted a study on the relationship between students‟ interactions and the sense of community in online learning environments. The survey study included 464 undergraduate and postgraduate students, and the results showed that the students felt a stronger sense of community when they interacted with each other to a greater extent. Similarly, Shea (2006) analyzed the course evaluations of 2,314 online students from 32 college campuses to investigate the mechanism of online learning communities. They found that the students who felt that the instructors who directly facilitated the student interaction by acknowledging consensus and disagreements of the students had positive outcome, such as a welcoming atmosphere for participation, avoidance of potential deviations, and increased sense of community among students. The results of this study indicated the relationship between interaction and the sense of community.

Another factor could be the size of the learning community. For instance, Lou, Abrami, and D'Apollonia (2001) reviewed 122 studies on small-group and individual leaning using computer technology (CT). The results showed that the size of the group affected the main result, which indicated that small-group learning with CT outperformed individual learning, with CT based on the students‟ cognitive, process, and affective outcomes. More specifically, the authors found that the students who worked in pairs often performed better than the students in larger groups. Another example is Lounsbury and DeNeui (1996) who reported that the sense of community of 774 college students varied depending on the size of their schools. This result indicated that the size of the community makes a difference in the way a person feels a sense of community.

Furthermore, the previous studies on sense of community in non-educational settings indicated that the psychological sense of community develops as the time spent together increases. Buckner (1988) developed a questionnaire instrument to measure cohesion in neighborhoods and tested the instrument with adults in 1,000 families that were selected randomly. The results indicated that the length of residency makes a positive contribution to the sense of community of people in the neighborhood.

## Methodological Procedures:-

This step includes the following two sections:

1. Section One: Designing and developing the experimental treatments.
2. Section Two: Building the study tools.

**Section One:**

Designing and Developing the Experimental Treatments

The present study was designed to investigate the effect flipped classroom model on learner experience of the learning environment, sense of community and e-learning projects performance. Student self-regulation was also taken into consideration as an independent variable. In order to achieve the study objectives, the researcher reviewed several instructional design models and the results of the review revealed that all instructional design models agree in the general stages and the general framework of the phases of the instructional design processes. However, these models differed in the view of the details of these processes so that every user of these models may develop elements consistent with his/her study goals and the basic needs required to achieving success. In the light of reviewing previous models, the researcher did not adopt any of the models but followed the general framework of these models in designing and developing the instructional treatments.

**First: Analysis Stage**

**Problem Analysis and Need Assessment**

Problem need is a gap between the current level of performance and the required level of performance; this process aims to identify problems and instructional needs, and formulated in the form of general objectives or goals. The need is the objective or the overall goal. The instructional needs were defined in the present study based on two aspects: first, the current level of performance on the course and second, the optimal level of performance. Based on an analysis of the current levels of performance in the e- learning applications course, the researcher found that there was a complaint from most students studied the course and this complaint indicating that students had difficulties and low levels in participating in discussion on several issues related to the topics as well as difficulties in understanding the basic minimum skills in e- learning applications. For the optimal or required level of performance, the analysis showed that students should have minimum basic knowledge and understanding in e-learning concepts and topics, as well as participating in discussion to uncover meaning and understanding with these difficult issues. Also, students were required to master the basic e-learning skills that enable them to perform the projects requested from them in the course.

In order to solve the problem, the researcher hypothesized that the flipped classroom model would help in this concern since the researcher would be allowed to shift from teaching in a teacher-centered manner to a student-centered manner. This shift would provide the researcher with the opportunity to engaging students with more collaborative activities, discussing several difficult ideas, concepts, and topics as well as would enhance the abilities of students in mastering the e-learning project-based skills.

**Analysis of Learners' Characteristics**

Analysis of learners' characteristics aims to identify the students who the instructional learning environments directed to them. In the present study, the instructional environments were designed for students of the Faculty of Education - Baha University. Students at Level 7 from three departments (Art Education, Physical Education and Special Education), who studying an e-learning applications course in the academic year 1435-

1436 (2014-215), as a requirement for the Faculty of Education, were the sample. Those students were all around the same age (age ranges from 18 to 21 years) and from the same area (Baha, Bilgurashy, Aquiq, Maqua, and Mandaq).

This age stage is characterized by several physical, mental and emotional characteristics. Individuals of this stage may reach the top of ability with the physical activity and visual and auditory sharpness. Intelligence is at maximum height. Students also may tend to be independent self-controlled and tend to pay more attention to talk and discussion with adults and peers to gain more confidence in order to strength his/her social status. Reading and the ability to control over self and deal with frustration is one of the characteristics of this stage. Flexibility and emotions control to achieve balance among intellectual, physical, and social activity is another important characteristic of this age group. One important feature had to be taken in consideration is the student prior knowledge about internet and computer skills. The sample had prior experience with computer and internet skills such as the ability of using search engines, downloading files, using chat rooms, and emails. Those students had studied some courses which gave them some basic skills in using internet and familiar with the Learning Management Systems such as Moodle. They are frequently using social media sites such as YouTube, Facebook, and some e-cloud storages such as drop box and Google Apps. It was also more important to make sure that the sample had an access to internet with home computers. All sample had computers at home as well as most of them had either a tablet computer or a smart phone.

**Analysis of Resources and Constrains**

At this stage, the available resources are analyzed to determine the necessary requirements for the development of the different learning environments. This was done by analyzing the resources, financial obstacles, instructional constrains, physical constrains, and human and administrative constrains.

In terms of the technical requirements, the researcher has sufficient expertise in programming, design, and some of the necessary skills needed to complete the development of the learning environments. All applications and software were all available for designing and developing the on- line part of the flipped classroom. In terms of physical requirements, the researcher had to check the availability of the following physical requirements: labs, computer equipment, and some rounded table and chairs available in the school of education, a place where the experiment was conducted. The researcher checked the availability of these requirements in the school of education. Two computer laboratories, in the Faculty of Education, Baha University, were prepared and arranged for the experiment with 23-

25 computer sets in each lab. The labs were equipped with all the necessary requirements for conducting the experiment. Two experimental rooms were designed for both the flipped and traditional learning environment groups with six rounded tables in each room for collaborative activities in the flipped condition and as a condition for the traditional group. For the design and development of the online part of the flipped classroom, a free LMS (Moodle) was used as a shell for the videos, assignments, and course contents for the flipped classroom condition.

**Analysis of Instructional Tasks**

This stage of the analysis is concerned with analyzing the general goals and objectives into their main components and sub-components. The instructional tasks are not the objectives and goals, rather they are more similar to the subjects, concepts, skills, main titles and sub-titles related the subject matter. In this stage, the e-learning applications course had (9) unit elements. These elements were: (1) e-learning concept, (2) e-learning characteristics, (3) advantages and disadvantages of e-learning, (4) comparison of traditional and e- learning, (5) raised issues about e-learning, (6) e- learning management system, (7) e-evaluation, (8) web 2 internet applications, and (9) some Google applications.

**Second:**

**Design Stage:**

The design stage aims to establish and set up the conditions and specifications of the learning resources and operations. This stage may include: instructional objectives design, measurement tools, content design, teaching and learning strategies, instructional interactions, instruction approaches and styles, teaching strategies, selecting learning resources and its descriptions, and finally making decision on acquiring or locally developed the resources. These phases and stages are detailed next.

**Designing Instructional Objectives:**

The instructional objective or the instructional aim is accurate words that are observable and measurable, describing the conditions that must be met by the learner after the completion of the learning lesson, unit of instruction or the course. Design the instructional aim required the designer to follow some practical sets as follow: translating the instructional tasks into instructional aims and wording them in a good format based on a suitable model. ABCD model used to word the instructional aims. This model helped the researcher to set the learner behaviors and the behaviors required to be done by the learners. In the light of content analysis to be explained next and the general goal of the course, the instructional aims were set for the course based on the conditions and principles of wording the aims.

Then, a preliminary 30-item instructional aims were presented to a panel of experts and specialists in instructional technology for judgment of congruency with the behaviors intended to achieve and the accuracy of the wording of each aim in the list. Then, the researcher statistically analyzed the data based on specialists' responses to the list, and calculated the percentage of how each aim related and covered the intended behavior. The aim which had less than 80 % agreement was amended and reformed in accordance with the view of judges. Finally, final list of the instructional aims achieved more than 82 % of agreement based on the judges' contributions.

**Designing Criterion Measurement Tools:**

In order to measure students' overall performance on the e-learning applications course, their perceptions toward the learning environment, and sense of community, the researcher designed three measurements plus the self-regulation questionnaire scale which was used as a classified variable before the study to begin. These scales and measurements are presented in designing and developing the study tools section.

**Content Design:**

Content design is known as defining the content elements that will be used to cover the instructional aims. These elements should be put in an order suitable for achieving the aims. There are several manners in sequencing the content. In the present study, the content was sequencing in a hierarchical organization by the subjects would be studied from top to down (from general to specific). The subjects of the content included only nine main titles. These main topics covered the course and detailed in modules. Each main topic had several other sub-topics.

In light of the identifying behavioral aims, the content to cover the aims were extracted. The researcher requested a panel of specialists in educational technology to judge the content with accompanied instructional aims. The aim was to verify to what extent the content topics covered the instructional aims as well as to what extent the content and aims were related. Further, specialists were asked to estimate the clarity and accuracy of the content. Based on experts' judgment, the percentage of agreement, in terms of content congruency with the aims and content sufficiency, was more than 87%. After this procedure, the researcher conducted all the changes and amendments requested and the final form of content was built.

**Designing learning and interactive instructional Strategies:**

The present study used two learning methods for delivering instruction, one was the traditional classroom method and the other was the flipped classroom method. Within the traditional, a lecture with PowerPoint presentation and note taking during the lecture was used as in-class activity as well as a laboratory activity was conducted inside a computer lab in order to enhance student skills in e-learning applications. Out-class activities included some homework assignments such as an individual weekly assignment and internet search for concepts building, comparison of ideas, comparison of LMS, writing summaries about raised issues in e-learning and so on. For the flipped classroom, the out-classroom activity included video lectures accompanied with quizzes submitted to the Moodle shell, and students were required to watch the videos before coming to the classroom, doing the quizzes, reading the module for the lecture on the Moodle, discussing difficult ideas with their peers using a discussion forum establishing for this purpose. The video was uploaded on the Moodle titled this week video. With the video, a video watching card was used to enable students to record their notes during watching as well as questions raised during watching to be discussed in classroom. The flipped in classroom activities included several strategies for enhancing the out-classroom understanding and providing more discussions about the topics.

**Designing the Traditional Learning Environment**

The traditional learning environment in the present study included two parts: in-class lecture as well as laboratory session and out-class homework. The e-learning applications course is a full-term course which is offered over 15 weeks, with three-hour class and lab time period per week, a total of 45 contact hours. It is traditionally taught with 15 lecture hours and 30 individuals, group work, and lab hours. During each period, most instructors give a lecture on a particular section and follow it up with a short period of completing practice questions. Sometimes, there is a student interaction during class, but generally, students try to complete practice problem individually and ask the instructor for help if they are confused. Laboratory work is often used depending on the issue discussed in class. Outside of class time, students complete assigned problem and can refer to note they took in class. It is not often that students interact with each other outside of class time. Primarily, students work towards attaining a grade in the course through completing graded assignments from the textbook, unit tests, a midterm exam, and a final exam. It is common practice for instructors to assign due dates and implement policies on late work. Based on this description, I taught this course for four years using the same teacher-centered manner described above. That is, until I decide to implement a flipped classroom model, which allowed me to grow from teaching in a teacher- centered to a student-centered manner. The traditional classroom activities included a weekly lecture using a PowerPoint presentation with the help of a ceiling projector. During the lecture students were taking note and were allowed to ask questions about the lecture. At the end of the lecture, a summary of lecture main idea was summarized by the instructor, and then a brief discussion on the lecture was available to make sure that students understood the contents. Following each lecture, a laboratory session was introduced. The out-classroom activity was done at home. Out-class activities included some homework assignments such as an individual weekly assignment and internet search for concepts building, comparison of ideas, comparison of LMS, writing summaries about raised issues in e-learning and so on. Table 3 shows the arrangements of activities in the traditional classroom environment in each 3-hour weekly lecture. Table 3: Class time activities in traditional method used in the present study.

**Table 3:-** Class time activities in traditional method used in the present study.

| | | |
|---|---|---|
| Before Class | Activity | Time on Activity |
| | Nothing Required | |
| In Class | Activity | Time on Activity |
| | Warm up activity | 10min |
| | Go over previous night's homework | 20 min |
| | Lecture new content | 45 min |
| | Guided and independent practice questions and laboratory activities | 105min (15min for guided and independent practice questions and 90 min Lab activities |
| After Class or Out Class | Activity | Time on Activity |
| | Individual activities such as problem solving cases, concept building, comparison of ideas, writing summaries, assignments and quizzes, and so on | |

**Designing the Flipped Learning Environment:**

As discussed in the literature, the flipped classroom model allowed instructor to shift from teaching in a teacher-centered manner to a student-centered manner because of the additional class time it provided for collaborative learning opportunities. When I taught in a teacher-centered manner, even though students claimed to be engaged, they still struggled to understand the material well-enough to be able to complete their homework. I wanted to utilize various student- centered teaching strategies such as problem based learning, student collaboration, and student- led discussions in an effort to promote student understanding and performance in the course. The flipped classroom model offered the time for the implementation of such teaching strategies.

In the present study, the flipped classroom model was implemented during my autumn 2014 term (September through December). The design of the flipped classroom in the present study was a hybrid course according to the general flipped classroom guidelines of delivering content out of class time and dedicating class time to student-centered learning opportunities as rooted in the flipped classroom literature. Essentially, what was traditionally done during class time was removed and placed out of class time in an online environment using the Learning Management System (LMS) Moodle Shell. This system allowed for the posting of video lecture lessons, online quizzes, announcements, and practice problems. The removal of content delivery from class time provided time to conduct content discussions, group learning activities, practice time, and assessments during class. In essence, the in-class workload and the out-of-class workloads were swapped or flipped as compared to traditional class. In the present study I used a closed loop flipped classroom model, which differed from most design literature proposed for designing the flipped processes. A three step-closed loop flipped classroom is shown in Fig. 1

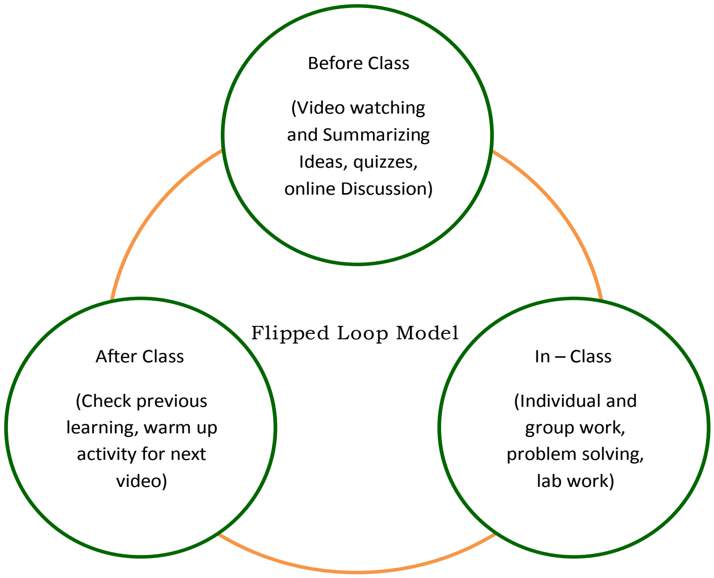


**Fig 1:-** A three step-closed loop flipped classroom used in the Present study.

**Table 4:-** Shows the arrangements of activities in the flipped classroom environment in each week ActivityTime on Activity

| | Activity | Time on Activity |
|---|---|---|
| Before Class | Watching Video | 8 to 15 min video (video can be reviewed, stopped, or paused for concentration and note taking)- time open for viewing several time for understanding |
| | Video viewing notes (taking notes from the video to prepare for discussion in class) | |
| | Short quizzes on the LMS Moodle | Time was open |
| | Online discussion via Moodle forum and chat room | Time was open |
| | Visiting course module in PDF file and PPT for assisting in learning | Time was open |
| In Class activities | Discussing the previewed video and other material and questions raised by students | 45 min |
| | Working collaboratively on an activity related to the previewed material using a variety of strategies | 45 min |
| | Lab work and application of practical skills | 90 min |
| After Class activities | Learning outcome check (online test module student had to complete within a given time) | 15 min |
| | Warm up activity for the next video and next week module (an open-ended question posted in the discussion forum required each student to comment) | Two days before the submission of next week video- time open for comment till the video submitted |

**Before Classroom Time:**

At the start of the term, students were given a schedule of topics that were going to be covered on each day. Students were asked to preview each topic out-of-class time before the day on which it was scheduled to be discussed. They were provided with a variety of learning materials including videos, online practice quizzes, and textbook problems for each topic. Students also could move to a discussion forum or a chat-room to discuss the topics with his peers for more interaction about the study topics.

Video cast: The videos were created using screen capture software (Camtasia). Each video topic was first designed as a PowerPoint presentation and inserted in the Camtasia software for recording the instructor voice and pen annotations with the help of a tablet PC and a microphone. Fig.2 shows a screenshot from a video lesson.


**Fig 2:-** Screen shot of a video lesson.

Videos ranged from eight to fifteen minutes in length and were organized by topic by week. There were 24 videos for 9 main topics in the entire course. Consideration was taken to make the video clear, concise, and relatively short in length to allow students to review them at separate items rather than in a single session. The videos included first a written title in its introduction followed by the instructor appearance, and finally the content displayed. The video represented either the important underlying conceptual ideas about e-learning or the steps in designing and developing some of major applications in e-learning followed by few worked examples. The videos were designed with these criteria in mind. Students could access the videos through Moodle LMS at times convenient to them. Fig. 3 shows the Moodle LMS home page screenshot.

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**Fig 3:-** Screen shot of Moodle LMS Lesson Homepage.

If students had difficulties accessing material, they had the option of requesting to obtain the video files via USB or Dropbox. Another option to request the video was to watch it and download from a Facebook webpage designed for the experiment. They were also able to view the videos on a computer as well as various mobile devices. Further, they had the opportunity to pausing, rewinding, fast forwarding, and replaying the videos. Students also had the option to choose what capacity of note taking they would employ. Students were provided with a vodcast notes worksheet for recording their observation. The viewing notes worksheet asked subjects to, write their notes in specific organization, make categories from their notes, and summarize these notes into three or four sentences. Further, the viewing sheet asked subjects to write down the questions raised during video viewing (Appendix E).

**Online quiz:**

Once they were finished with a video, they were provided with an online 5-question quiz through the Moodle LMS relating to the topic, which was intended to help them reflect on what they had learned in the video. Fig. 4 Shows screen shot of online quiz.

**Fig 4:-** Screen shot of online quiz.

The quizzes were programmed so that students obtained instant feedback regarding the question they answered. Answers could be entered either as text or a multiple choice selection and feedback included the correct answer as well as some hints on how to proceed with the problem or where to find an explanation of the concept. Students could repeat the quiz as many time as they chose to, and whenever they chose to, and they did not contribute to their final grade. Suggested textbook problems: Students were given with a list of suggested practice problems from the textbook on that topic. The suggested practice problems had answers in the textbook that students could refer to, they were not collected, and they did not contribute to students' final grade. The learning tools provided out of class time, which included videos, problems given in the videos, quizzes, and suggested textbook problems, were provided with the intent that students would use them as a platform to ask questions about, and to develop a sense of, what they need help with. Most importantly, students had fair and autonomous choice over a variety of learning materials they could engage with out of class time to prepare for class time discussions and activities.

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**In-Classroom Time:**

Class time was generally structured so that the first half of the class (90 min) was spent either discussing the previewed material or working collaboratively on an activity related to the previewed material. Discussions were student-generated and were based on material that was previewed prior to the class. These discussions were facilitated and prompted students to think about the connections throughout the material in order to give opportunities for the development of understanding. Opportunities for developing understanding were also present due to the collaborative nature of the activities. These often consisted of engaging open-ended problems and collaborative review discussions. Some activities and assessments also encouraged student-generated examples. The second half of the class time (90 min) was spent on a laboratory work to make sure that all students were able to use the e-learning skills to build up their own e-learning projects.

Several techniques were adapted from Farag (2013) to be used in class to assist students to discuss and share their ideas with the whole class. Some of the techniques used by Farag (2013), in a blended instructional technology classroom course, to encourage more individual and collaborative activities in the classroom were polling technique, team matrix, reaction sheet, three-step interview, immediate feedback assessment, think pair, and concept map or word web technique. Some of these techniques were used in the present study in the hope that they encourage students to discuss issues related to the previewed learning material.

The first technique used in the present study was the team matrix technique. This technique was used to uncover the misconception students had about concepts previously learned. The technique was implemented when a new concept was introduced that is similar to one another. For example, the concept of e-learning was used interchangeably with the concept of virtual learning, digital learning, web-based learning, network-based learning, and so on. The team matrix was used to help find the most salient features of each concept while differentiated between each other. Pairs of Students were presented with a list of characteristics that may or may not be shared between concepts and had the students determined which characteristic belonged to each (or both) concept(s). After this, to check for comprehension, answers were discussed with the entire class. This activity lasted between 10 to 20 minutes.

The second technique used in the present study was the reaction sheet technique. Based on questions generated by the instructor related to a topic presented in the video lecture, the class was divided into small groups and each group was given one of these questions. Each group spent 5-7 minutes write everything come to mind in relation to the topic. Next, each group moved to another table and looked at another question and the comment which had already been recorded, reviewing them and adding additional comments. After each group were added comments to all other groups' questions, returned to the initial question, reviewed the additional comments provided, and summarized to the entire class. This activity lasted about 20-30 minutes.

Based on student viewing of the online videos, they came to class prepared with some questions would be asked. A technique called three-step interview was used to discuss in depth these questions. Students were grouped in pairs, and each student took a few minutes to interview the other about the material that was viewed online. After each member in the pair interviewed each other, the pair summarized their partner's response and then shared them with another pair of students.

The fourth strategy used in class was the think-pair share technique which is a three step phases. This strategy lasted between 20-30 minutes. Group size was 2 students. The first step was to think alone step which required the student to take a central concept presented in the video previously viewed online and reflected on it and discussed it in depth. The student reviewed the concept through the video viewing sheet, and then discussed in further and wrote down the thought on a sheet of paper. The second step was to discuss their response with a partner. The third step was the share phase which required all students to engage in a wider discussion demonstrating the many different perspectives.

The fifth technique used was a concept map/word web technique which is an individual activity lasted between 30-45 minutes and could be used for group activity. This technique required the student to represent the concepts learned in the online video tutorial in a visual manner. When students mapped out the concepts, they were required to build connections between ideas and topics. For example, students represented the differences between e-learning and traditional classroom learning in a web word. Gaps found in the visual map were discussed in the whole class for promoting more in depth discussions.

Some other activities were used inside the flipped classroom which encouraged students to assess their understanding of the previously learned material. Such activities included polling technique (PT) and immediate feedback assessment technique (IF-AT). The polling strategy required each student to respond to multi choice questions and on a board and picked up a card with the right answer. Students were requested to gauge the variance in answers. This strategy was used to determine whether or not a student was fully understood the previous online video lecture. The immediate feedback assessment technique was another multiple choice questions written on a white board, and student thought the answer for 3-5 minutes, then they requested to scratch a pre-prepared card to reveal what they thought was the correct answer. Students began by answering the list of questions about the topic studied before on their own without use of Immediate Feedback Assessment Technique (IF-AT). Afterwards, students worked with a group to go through the questions, convinced one another of the correct answer, and then scratched the card to discover what was right. This strategy was used to provide immediate feedback to students about concepts tested in the online video and online modules outside the class.

**After Classroom Time:**

The after classroom time was based on two parts; part one was designed to assess the whole learning process; part two was designed to warm students up for the next video lecture and next subject. The whole learning process of the flipped classroom had been completed with the previous two stages before and in-class activities were assessed in after class time. It was necessary to have a check on student's learning outcomes. Hence, an online test module was provided on the LMS Moodle which contained some relatively difficult and extended test questions corresponding to the pre-class knowledge. Students had to finish these questions within a given time so that both the instructor and students could make a direct and quantified evaluation of the flipped classroom effect as a teaching strategy. However, the grade on the online test was not taking in a student final grade. Before the next lecture video, students were given a question posted on the online forum; when a question posted by the instructor, students were announced that they had to respond and comment on the question with their peer in the online discussion forum as a warm up activity to activate them to think about the coming video lecture.

**Help and Assistance:**

Students in both the traditional classroom and the flipped classroom were provided with some help and assistance before the instruction to begin. In a traditional lecture-type session with written guidelines, students in the traditional classroom were provided with the following supports that would help them to be active participants. They were given instructions about the aims and nature of the study, the effort had to be exerted to achieve success, their role during and after the traditional lecture, assessment type would be used to end with the instruction, and assignments and scales required to be done. For the flipped classroom students, instructions presented in a written form with the help of a PowerPoint lecture showing the online part of the classroom. Students were given instruction on how and when to participate in an activity before the classroom using the Moodle LMS, how and when to view the video lecture online and record their notes during viewing, how and when to participate in a discussion forum, how and when to take an online quiz, and so on. Following the instructions for the out-class activities, they were also informed that they would be provided with in-class activities and after class activities and both activities were essential parts of their flipped classroom learning. Instructions about their assessment methods were also presented and asked to response to the online scales and measurements which was before and after class.

**Selecting Instructional Media:**

The learning resources included written text, photos, PDF files, PPT presentation and video files. All these resources were as supports for the instructional modules which covered the topics content. Criteria for using the instructional media were considered in order to facilitate learning within the flipped learning environment. The written texts were included in every page of the module pages and each learner could easily read them. The video files were recorded as a series of clips with the accompanied sound to show the learners every part of the content. Videos were produced and edited using Camtasia software, and uploaded into the Moodle LMS. The PowerPoint presentations were also available for all topics. An online discussion was created to establish areas for discussions about all the module topics. A chat room was designed to enable learners to engage in content related online dialogue.

**Designing Scripts:**

Script is a procedural map includes executive steps for the development of a certain instructional source. This map should contain all the conditions, descriptions and details of the media such as the audio-visual elements, and describe the final shape of the production process on a sheet of paper. Designing a script is varied on accordance with differences in the nature of the product and required details. However, in general, there should be some basic details included. In developing web-based sites, details such as screen numbers, content of the screens, the screen text and audio, static pictures and videos, sketch of the screen and the transition between screens should be available in the script.

The researcher designed the instructional script in steps and stages with a general outline being drawn first followed by detailing of each main screen. Each screen included the following details: screen number, screen type, description of the screen, and drawing sketch of the screen. Based on these details, a script was created. After building the scripts for the online part of the flipped classroom, a panel of specialist in educational technology field approved the script and the final form was produced.

**Third:**
Development Stage

The development stage refers to the processes by which the conditions and standards built within the design stage would be transformed into complete and ready for use instructional products. The instructional development stage includes the following phases:

**Development of Content elements:**
In the light of what was determined in the design stage, multimedia elements were collected from different sources. The following procedures were conducted to collect media. Texts: Microsoft Word software was used to write texts with the consideration being taken to suit the font size with the size of the screen and the space available for presenting the onscreen text. Fixed Photos: Adobe Photoshop 8 CS ME was used for producing and editing the pictures and photos that had been collected. The researcher collected several photos and pictures related to the contents of the lessons. These photos were edited and deleted the irrelevant parts and retain the required parts. Enlarging and minimizing the photos upon need were done, as well as comments were added to some photos when needed. All photos were saved as "GIF" extension because this type of extension is more suitable, in terms of clarity and size, for publishing online. Sound: editing and processing sound was done using the Cool Edit software. Videos: producing video clips was done using Camtasia software, with the video files ranged in length between 7 to 15 minutes. All lectures were produced first as PowerPoint presentation and then inserted into Camtasia software and edited with the addition of a lecturer sound comment accompanied with each video. PowerPoint presentations also were uploaded as weekly lecture contents into the Moodle LMS.

**Development of Website Pages:**
The website pages were created using FrontPage Software in the light of the site script. It was important to take into consideration when development of website pages that the links to move within the same page were not available that is, each page was independently separated and no internal links were existed within the website same pages. When opening the page in the internet Explorer, pages were shown as the students would see on the internet through the created site.

**Downloading Moodle Software:**
Before downloading the Moodle software, the local host http://localhost, site folder and database were established. For Windows, a copy of XAMP package (WAMP =Windows Apache MySQL PHP) was downloaded from the site link: http://www.apachefriends.org/en/xampp-windows.html Then, the package was installed onto the computer as any normal applicable software. After that, the Moodle software zip package was downloaded from the site: http://download.moodle.org/windows, and then the zip package was decompressed and inserted into the www file inside the WAMP folder found on the "C" Computer Drive.

**Building the Website:**
Start Moodle and StopMoodle were used to turn on and off the website. For the first time to build a website a number of procedures and steps should be followed and some information was requested such as username, password, e-mail address, and selection of language package. Some steps were needed to select the setting of PHP as shown in Fig.5. After these settings, the site could be turn on using Start Moodle by accessing from the local- host: http://localhost.

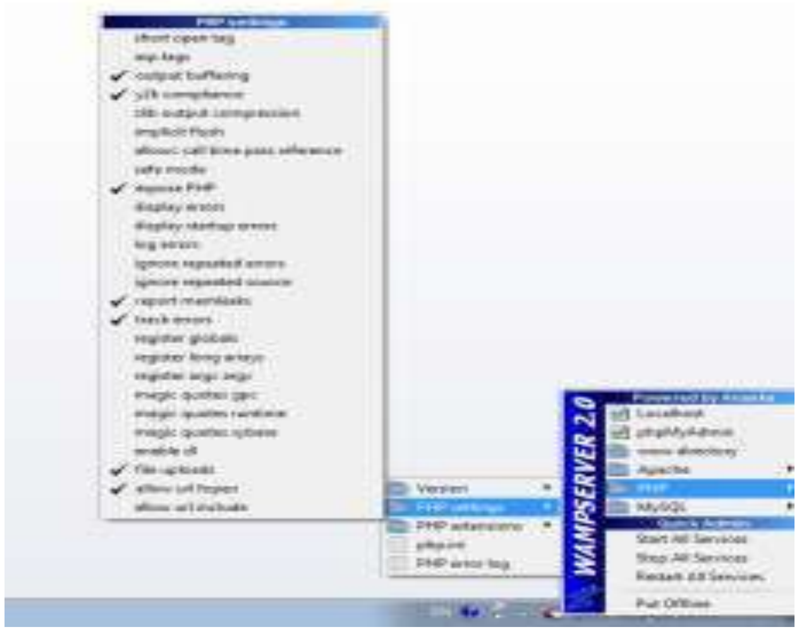

**Fig 5:-** A screen shot of PHP Setting.

Host and Domain: A Host and domain name was purchased from Hostgator Global Company and the domain name was: http://lightnile.com

**Hostage Settings:**
The hostage was prepared using the control panel using a username and password, and then the homepage, databases and settings for Moodle requirements were done. The sub-domain for Moodle was created as: http://m.lightnile.com after creating the homepage at: http://lightnile.com.

**Uploading the Site to the Internet:**
The site was uploaded from the home personal computer using any FTP software. The FileZilla Software was downloaded from: http://filezilla- project.org and installed on the computer. The site then was uploaded using FileZilla from the computer local host to the internet.

**Development of Activities and Blocks on Moodle:**
There were a range of activities and blocks being in the MOODLE LMS and were created in the present study as follows: (1) Modules: The E- learning Applications Course was delivered as nine modules, and each module included unites and lessons and the related activities required to be done individually by each student. (2) Instructional Activities: Moodle was used to add activities to the site, in that, a range of instructional activities after each unit were created to be implemented individually or in cooperation. (3) Formative Evaluation: Moodle was used to add a formative assessment to the site, in that; an evaluation was added after each module and unit. This type of assessment was in the form of 5- item quizzes to be done. Each quiz was created depending on the subject studied in the video lessons delivered on the Moodle. Questions bank was built included all the questions would be added in evaluating the modules. After creating the questions bank, the questions related to each module were moved to the formative evaluation of this module. The quiz evaluation let the student to have three trials to perform the quiz and the score was given as a mean of the three trials. The response results would appear immediately on submitting the response. (4) A discussion forum was created as one of the activities for sharing ideas and opinions with the instructor or among the learners one another. (5) A chat room was also created as one of the activities for sharing ideas and opinions with the instructor or among the learners one another but in a synchronous manner. (6) An individual System and Site Registration was designed for delivering instruction to level seven students at the Faculty of Education Baha University. For this reason, access and registration into the website was required from each student. The registration system depended on some fields that were required to be filled and submitted by the learners to the site administration. No learners can access the website without permission from the administration. After submission of the user's data, the data was classified by the administration and an email directly sent to the use

with the user name and password. (7) A Site Block Agenda (Calendar) which showed future or past activities in the site was available. It is a record of ongoing and future and past activities kept in a database. This database is activated immediately when the learner pointed on a date or a link to show everything about this date and activity. When the learner clicked on the link, all details about the event would be presented even though the event happened long time ago. (8) People Block: This block showed all participated learners for another learner or for the instructor. (9) Site Administration Block: Administration Block enabled the researcher to control over the website and the course. Within this block, the researcher was able to add and remove students, as well as add and remove courses. It enabled the researcher to backup copies of the site and control over the activities, blocks, security options and the appearance of the site.

This block helped the researcher to provide the learners with performance reports within the course. (10) Recent Activities Block: this block enabled the user to see what happened since the last visit for the learner in an abstracted manner, and might give the leaner a detailed view of recent activities when the learner clicked on full recent activities report. (11) Upcoming Event Block: this block revealed the upcoming activities, evaluation and days off activities. It enabled the instructor to post events related to the course. It included links to the evaluation block and offered the instructor to add a new event and linked it to the calendar. (12) Test Results Block: this block showed the results of the learners in the formative evaluation for modules and topics of the course with a score and a percentage. The instructor of the course had the control over what results would be appeared to the students and what would not.

**Technical and Validity Tests of the Website:**

The site was tested using several different technical examinations as follows:

9.1. Component and modules testing: this test was conducted to make sure all the components of the site separately worked as designed.

9.2. Integration testing: after checking that each component effectively worked and designed was accurate, checking that every part worked together with the other parts of the system.

9.3. Function testing: this testing means that the site after integrating all its parts did the functions effectively.

9.4. Performance testing: the site was experimented in the learner and instructor environment to make sure its compatibility with the available computers and equipment in the user environment.

9.5. Acceptance testing: this testing was done with user to make sure the site achieved the desired user expectations and needs.

**Section Two: Building the study tools:**

**Learner Self-Regulation Scale:**

The present scale was designed to measure learner self-regulation strategies in a learning environment required subjects to implement these strategies during addressing instruction individually or collaboratively. In order to establish a self-regulation measure, the researcher had to survey several different studies and researches to uncover the underlying components of this construct. The results of the survey revealed that most researches and studies agreed with four basic components of this construct, and these were: (1) planning and setting goals for learning, (2) monitoring and keeping records, (3) recitation and repetition, and (4) seeking social assistance. Recent developments in self-regulation studies comment upon these four component model and suggested other dimensions such as self-evaluation and environmental structure to affect self-regulation strategies. Finally, the researcher after reviewing most of these studies built a seven construct scale to measure self-regulation strategies. The seven dimensions of the scale were: (1) memory strategies: this dimension included 14 items. (2) Goal setting: this dimension included 5 items. (3) Self-evaluation: this dimension included 12 items. (4) Seeking assistance: this dimension included 8 items. (5) Environmental structure: this dimension included 5 items. (6) Learning responsibility: this dimension included 5 items. (7) Organization: this dimension included 6 items. Overall scale consisted of 55-questionnaire type items (Appendix A). Table 5 shows the distribution of items by scale dimensions.

**Table 5:-** Distribution of scale items by dimensions.

| No | Scale Dimensions | No of Items | Distributions |
|---|---|---|---|
| 1 | Memory Strategies | 14 | 1-14 |
| 2 | Goal Setting | 5 | 15-19 |
| 3 | Self-Evaluation | 12 | 20-31 |
| 4 | Seeking Assistance | 8 | 32-39 |
| 5 | Environmental Structure | 5 | 40-44 |
| 6 | Learning Responsibility | 5 | 45-49 |

| | | | |
|---|---|---|---|
| 7 | Organization | 6 | 50-55 |
| Total | | 55 | |

To ensure complete and correct responses, instructions on how to respond to the scale and items were included. These instructions directed subjects to put a tick (√) opposite to the item that expresses his selection. The guidelines asked subjects to be careful and not to spend too much time thinking about each statement, rather to give his response as comes closest to matching his agreement. Further, the guidelines indicated that there was no correct or incorrect answer and all the statements had to be done. Learner responses on the scale would be one selection from five available ones, and these were: (1=strongly agree, 2=agree, 3=neutral, 4=disagree, and 5=strongly disagree). The instrument was designed to be used at the start of the experiment. The aim was to estimate the level of self-regulation strategies in order to classifying subjects upon their responses to high self-regulation learners and low self-regulation learners. For this purpose, the responses on the 55 items were scored depending on the mean average of responses. The maximum scores for this scale were (5) points, minimum scores were one point, and the mean average was (2.5) points. Students who had 2.5 point or more were classified as high self-regulation learners whereas those who below the average (2.5 points) were considered as low self-regulation learners. Based on this scoring, of the 97 students, 40 students were considered as highly self-regulators and 57 were considered as lower self-regulator learners. The self-regulation scale was administrated online in the Moodle shell as a pre- measurement required before the experiment to start. Cronbach's alpha scores range from (0) through (1), with a coefficient closer to (1) indicating higher reliability. Reliability coefficients should be at least 0.70 or higher to be considered reliable for affective instruments. The Cronbach's Alpha for the questionnaire items was 0.77, which indicates an acceptable degree of internal constancy in a multi-item scale.

**Perceptions of Classroom Environment: Questionnaire:**

The computer survey instrument for this study was the experience Survey, developed by the researcher to identify the level of experience in both traditional and flipped classroom learning environments. The experience of classroom: is defined in the present study as the views and opinions of the participants around all the experience inside their classroom learning whether this experience gained from a traditional classroom environment or a flipped classroom environment was helpful in making great effort and self-learning. Experience of classroom environment was reflected in students' views about the types and amount of interaction provided in the environment. The focus was to measure experience with three types of interactions: learner-content interaction, learner- instructor interaction and learner-learner interaction. For the first types of interaction, students were asked to provide their views about activities, practices, assignments, discussions, and problems solving offered within the environment as well as the quizzes and types of evaluation they encountered. Students' views about learner- instructor interaction and how well the instructor assisted in offering opportunities for the students to engage in a meaningful learning environment. Finally, students' opinions and views about the types and amount of student-to-student interaction were also a main dimension in the experience of classroom measure.

All survey items used a 5- point Likert scale, with (5) strongly agree, (4) agree, (3) neutral, (2) disagree, and (1) strongly disagree. The scale consisted of 40 items; with 31 items being positive statements about student experience in the environment whereas 9 statements indicating negative experience. Two forms of the instrument were designed, one for the flipped classroom learners (Appendix C-1) and the other for the traditional classroom learners (Appendix C-2). The scale for nine negative questionnaire items (items, 7, 9, 11, 12, 14, 16, 26, 27, and 32) were reversed to maintain consistency in the scales of the variables. The main objective of the scale was to measure how the students felt about their experience with either the traditional classroom environment or the flipped classroom environment. For this reason, guidelines were provided at the top of the scale for the students to ask them to respond to the statements by giving their feelings to what extent the statements agree with their feelings. Instructions requested students to respond to all the statements, ensuring that there would be no correct or incorrect answer. Students were told that they could choose one answer and when they were unsure about a statement they could choose the selection "neutral". The instrument was established to be used immediately after the experiment to end. Responses on the 40- item questionnaire like scale were scored based on calculating the mean average of responses. The highest scores were five points but the lowest were one. Students who scored below the average 2.5 were marked as having negative experience with the environment whereas scores recorded at the average or above indicated positive experiences. Based on this scoring technique, the data was collected from the participants. For external validity, pilot field experimentation for using the questionnaire was done to ensure that all the items were clear and the scale could be used with the main sample of the experiment. For internal validity, six specialized professors from three departments (Education and Psychology Department, Instructional Technology Department, and Curriculum and Teaching Methods Departments) were asked to validate the scale. They were requested to ensure that the items really measured what they intended to measure. Deletion and addition of any information was taken as suggestions for improvement upon the instrument. Final forms of the instrument included these suggestions. Responses of the judges were analyzed and processed to ensure internal validity. 84 % of agreement was estimated for this scale based on the judges' responses.

**Sense of Community Scale:**

In order to measure sense of community of learners in this study, the researcher developed a scale based on reviewing several studies. The construct of sense of community may be defined as "a feeling that members have of belonging, a feeling that members matter to one another and to the group, and a shared faith that members' needs will be met through their commitments to be together" (McMillian & Chavis, 1986, p.9). The scale construction was based on this definition of sense of community. The instrument was built based on four components that measured the sense of community. The first element of the instrument measured membership. Membership is the feeling of belonging or of sharing a sense of personal relatedness. The second element was designed to measure influence which is a sense of mattering, of making a difference to a group, and of the group mattering to its members. The third element was reinforcement which is integration and fulfillment of needs. This is the feeling that members" needs will be met by the resources received through their membership in the group. The last element was shared emotional connection, the commitment and belief that members have shared and will share history, common places, and time together and similar experiences. Based on this 4-dimesions construct, the instrument was designed to have 43-item questionnaire. All scale items used a 5-point Likert scale, with (5) strongly agree, (4) agree, (3) neutral, (2) disagree, and (1) strongly disagree. The scale for two questionnaire items (items eight and nine) were reversed to maintain consistency in the scales of the variables. The guidelines for this scale stated: "Dear student: thank you for taking the sense of community scale. The information collected from this scale will be used solely by the researcher for the purpose of study your feelings and perceptions toward the community in the classroom environment. This scale is not related to your assessment in the course. Any published findings will be anonymous and participants' confidentiality will be preserved. Please read the statements below and click in the circle next to the response that comes closest to matching your feelings concerning the sense of community in the classroom during studying the E-Learning Applications Course. There are no correct or incorrect responses. Please respond to all statements by following these guidelines before submitting your response to any statement of the scale items. When you are unsure about your agreement, you may choose the selection neutral. Before responding to the statements, please provide us with your ID, your name, and the group number. Upon on finishing these personal details, you provide your response". The highest scores on the scale were five points but the lowest were one. Students who scored below the average 2.5 were marked as having low sense of community in the classroom environment whereas scores recorded at the average or above indicated high sense of community in the classroom environment. Based on this scoring technique, the data was collected from the participants. The internal validity of the scale was established by having six specialized professors to comment on it the same as what happened in the experience of classroom scale. Internal validity estimated for the sense of community scale was 88 % of agreement.

**E-Learning Projects Rubrics:**

Students in the present study were requested to submit three e-learning projects, one was an electronic website using Google Site Application, another was an electronic blog using Blogger Website, and the other was PowerPoint project using Google Forms Application. In order to evaluate student's projects, three evaluation rubrics were created, one for assessing the website, another for the blog and the other for the PowerPoint presentation. The main objective of building and designing the rubrics for e-learning projects was create and develop a set of common standards and indicators that would help, assist, and enable evaluators of the projects to use a fixed unified scale to assess how acceptable the projects would be. Letting evaluators use their own views and scoring the projects would not be fair because of lacking objectivity, therefore, establishing for them rubrics would assist in making the evaluation process easier and more accuracy.

In establishing the rubrics, the first rubric used for assessing the website project included 12 standards, the second rubric used for assessing the blog project included 6 standards, and the PowerPoint project was assessed using a nine-standard rubric. For this reason, four criteria were used to evaluate each standard and its indicators. And these were (1) Excellent: when the standards and its indicators exceeded or above the criteria, (2) Satisfactory: when the standards and its indicators met the standards, (3) Limited: when the standards and its indicators needed developing, and (4) Unsatisfactory: when the standards and its indicators did not fulfill the lower level of standards and accordingly the standard and its indicators needed more work and not accepted in its present form.

For scoring the website project, each of the twelve standards had a four- point scoring on the scale, and the total maximum scores for the project were forty-eight points whereas the lowest scoring was twelve (Appendix D-1). The same manner in scoring was used in evaluating the blog project, with maximum scoring for the six standards being twenty-four points but the lowest scoring being six (Appendix D-2). For scoring the PowerPoint (PPT) presentation, a scoring from three to zero was used to assess a quality of each standard, with a scoring of twenty-seven being the maximum but zero scoring being the lowest score (Appendix D-3). The Total score for all three projects was 99 points. In the website project rubric, a project was considered as above standard when it gained between 40 to 48 points, when it gained between 31-39 points the project was satisfactory and met standard, between 22-30 point would indicate that the project needed developing, and finally points between 12-21 indicated that the project needed more work and not accepted. The same procedure for calculating the total scores on the website project was also used for the blog and PPT projects. Evaluators were requested to score each standard and put a total score for the whole project in the space provided for these purposes. Each of the three e- learning rubrics was provided with instructions at the topic of the rubric to show the evaluator how to use the rubric for scoring the student project. Before instructions, details such as student name, ID, evaluator name, and the date of evaluation had to be filled in before the assessment to start.

**Procedures:**

Preparation for the study began during the summer of 2014. During the February-June session, lecture video recording of my Electronic Learning Applications 13061401 class were made. These were edited via Camtasia 2 into convenient 8 to 15 minute segments and uploaded to the Moodle LMS for later access by the flipped classroom.

Prior to the start of class in the fall of 2014, approval to conduct the study was obtained from the Department of Instructional Technology at the Faculty of Education- Baha University in Saudi Arabia. On the first day of the class, the students in both conditions (flipped class and traditional classroom class) were informed about the study and permission was obtained from them to participate in the study. Students who excused for not participating were left for regular traditional classroom sessions and excluded from the experiment.

Once the two participating sections were determined and initial data was collected, and instruction began as normal. The first unit covering the concept of e-learning and history of e- learning was covered in the traditional manner for both classes. At the end of the first session, the Self-Regulation Scale was ready to be done on all computer sets in the computer laboratory and was given to both groups for estimating their self- regulation strategies (See table 1, for students' distribution based on classroom environment and self-regulation scores). Upon finishing this scale, students were told that the session was up, and the next day username and password were sent to the flipped classroom group to use for accessing the Moodle for the out-classroom activities. The flipped classroom group was given the instructions to sign in the Moodle to see the first video lecture for the course, the quiz for the lecture, and was provided with an online video viewing card to get the most of their video viewing.

The second unit, covering the concept of e-learning and characteristic of e-learning, was covered traditionally for the traditional classroom group whereas for the flipped classroom group was done in flipped session. The videos that were uploaded on the Moodle LMS during summer along with PowerPoint Presentation, Quizzes, and discussion forums were assigned as homework for the flipped class with two to three of these to be watched and done before each class. When the flipped group came to the class, they were prepared with some questions and a summary of main ideas and concepts and class time was spent engaging the students in the material. Time spent in-class activities was split into three sessions. One session was designed for discussing the previewed video and other material and questions raised by the students. Another session was spent on collaborative work using several different strategies. The other session was used for practical work in the computer laboratory. Approximately 45 minutes were assigned for questions asked by the students about the video viewing and their recording notes from the video. Another 45 minutes were assigned for activities designed by the instructor/researcher to ensure that the information, concepts, and ideas discussed in the video were understood. The remained 90 minutes for the class were computer lab work. Class time was spent on collaborative group work (for more information about in-class time activities see Section 4.2.2). After class time, students in the flipped group, were requested to take an online test for the unit already studied in order to make sure that all information in the unit was understood and this test is timed and was found in the Moodle shell. Upon finishing the test, students went for the warm up activity which was an open-ended question posted by the instructor before the next video to be available for watching. The warm up question activity was purposed to prepare students for the next video.

Meanwhile, the control group (traditional classroom group) was taught using traditional methods. All problem and activities completed in class by the flipped classroom group were assigned as homework to be completed individually after the lecture covering the concepts relating to these specific problems and activities. Also, the online test used as learning outcome check for the module which was given to the flipped classroom group was also given as homework test for the traditional classroom group. This test was also required to be done upon finishing each lecture as homework. Class time for the traditional classroom group was spent with the researcher/instructor lecturing and working through example problems. The lecture was an interactive one with frequent questioning of the students, but the level of individual engagement was much less when compared to the flipped classroom group. The idea was to keep the material covered, the lecture viewed, and the exercises completed for both sections of the study groups to be as similar as possible. This is why choice to use my own recorded lectures was used to implement the flipped classroom model instead of referring students to some of the pre-made lecture substitutes on YouTube as an example. I feel that this helped ensure that any differences in the measured outcomes of the two sections can be more readily attributed to the implementation of the flipped classroom model rather than some confounding factors.

At the end of the nine modules course, students in both sections of the study came to the computer laboratory to complete the procedures of the study. Two computer instruments were given to the whole sample after finishing with the study course; the first instrument was the experience of classroom scale; the second instrument was the sense of community scale. Both scales took approximately 40 minutes to be done. After conducting these two instruments, students were requested to submit three e-learning projects, and were given three weeks for finishing with them. Students had been informed during the lab activities that they would be required to submit these projects by the end of the study. They had been also informed about the manner in evaluating the e-learning projects based on the criteria used to for assessment.

## Results & Findings:-

This section presents the data analysis and results for the research questions of the study, and so the results will be presented in terms of the determined questions. The analysis of variance of environment [2: flipped classroom vs. traditional classroom] by self-regulation [2: high vs. low self- regulation] by experience in the classroom environment [2: flipped classroom experience vs. traditional classroom experience] by sense of community [2: flipped classroom learner perceived sense of community vs. traditional classroom learner perceived sense of community] by e- learning projects performance [4: website, blog, PPT, and total e-learning project]. The results are presented in the three sections that follow.

Section one: experience of environment, section two: sense of community, and Section three: e-learning projects performance

**Section One:**

**Experience of Environment**

When the analysis of variance involved classroom environment [2: flipped vs. traditional] by self-regulation [2: high vs. low self-regulation] by experience of the environment, the analysis showed several significant effect. There was an effect of classroom environment (F=2151.041; df 1, 93; P=0.00; $\eta 2$=0.959), and of self-regulation (F=133.873; df 1, 93; P=0.00; $\eta 2$=0.590), and of classroom environment by self-regulation (F=11.272; df 1, 93; P=0.001; $\eta 2$=0.108). These results are presented in the three sections that follow.

**Classroom environment by experience of environment:**

The first question of the study states: How do students experience a flipped classroom model? Question one addressed the experiences of students in both traditional and flipped classroom environments. Students in both environments received a 40-item questionnaire after participating in the experiment for measuring their experience with the environment. A Likert-type scale of five possible responses, spanning from strongly agree to strongly disagree, was used. The scale for nine questionnaire items (items, 7, 9, 11, 12, 14, 16, 26, 27, and 32) were reversed to maintain consistency in the scales of the variables. The average mean score for the experience in the flipped classroom environment scale (M=4.13, SD=0. 24), showed that, overall, participants had high and positive experience in the flipped classroom environment. The 95% confidence interval for this mean was 4.08 to 4.19. Therefore, overall participant experience in the flipped condition would be positive. The average mean score for the experience in the traditional classroom environment scale (M=2.17, SD=0. 37), showed that, overall, participants had low and negative experience in the traditional classroom environment. The 95% confidence interval for this mean was 2.18 to 2.29. Therefore, overall participant experience in the traditional condition would be negative.

Overall, learners in the flipped classroom environment showed more positive experience with the flipped classroom than with the traditional classroom environment.

In order to look at the difference between both environments on learner experience with the environment, an ANOVA was conducted on the data, and the results showed a main effect of the classroom environment, ($F=2151.041$; df 1, 93; $P=0.00$; $\eta 2=0.959$) with the flipped classroom group having higher positive experience than the traditional classroom group. This result is presented in table 6 and Fig. 6.

**Table 6:-** The between subject effect of the classroom environment by learner experience.

| | Sum of Square | df | Mean Square | F | Sig. | η2 |
|---|---|---|---|---|---|---|
| Contrast Error | 83.924 | 1 | 83.924 | 2151.041 | .000 | .959 |
| | 3.628 | 93 | .039 | | | |

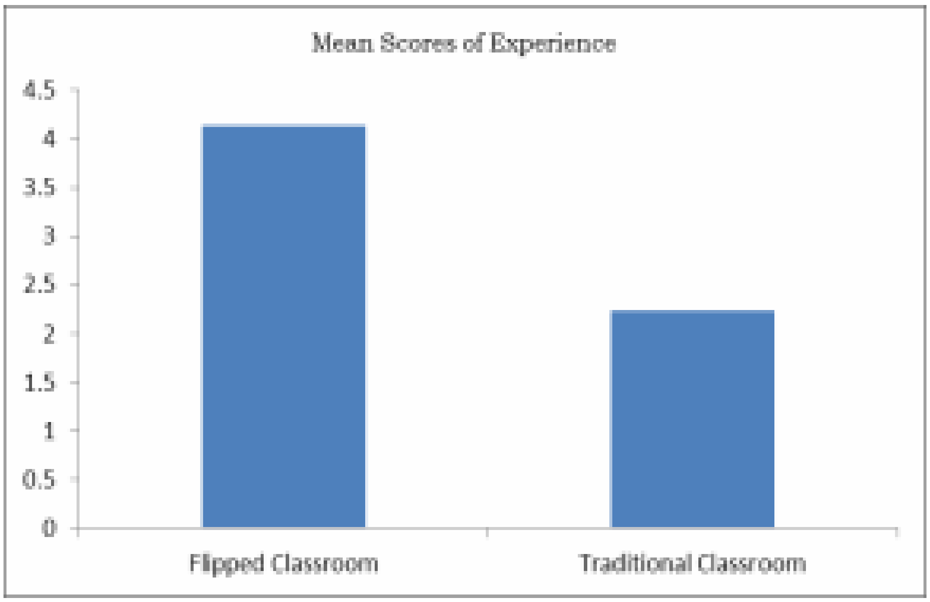


**Fig 6:-** Main effect of classroom environment by learner experience of the environment.

**Self-regulation by experience of environment:**

Question four of the present study states: Do student experiences with the flipped classroom model as measured by perceptions of flipped classroom scale be affected by learner levels of self- regulation? Question four addressed whether student experience with the classroom learning environment would be affected by level of learner self-regulation. Learners were classified into high and low self-regulators based on a 55-item scale. A Likert-type scale of five possible responses spanning from strongly agree to strongly disagree was used. The total score on the measurement was calculated based on student response on the 55 items included. Scores ranged from 1 to 5, with scores ranged from 1 to below 2.5 considered as low self-regulator learners whereas scores ranged from 2.5 and above were considered as high self- regulator learners.

The average mean scores for the experience in the learning environment with respect to the high self-regulator learners ($M=3.51$, $SD=0.91$), showed that overall participants had high and positive experience with the learning environment. The 95% confidence interval for this mean was 4.3 to 2.5. Therefore, overall high self-regulator learner experience in the classroom learning environment regardless of the type of the environment would be positive.

The average mean scores for the experience in the learning environment with respect to the low self-regulator learners ($M=2.97$, $SD=1.04$), showed that overall participants had high and positive experience with the learning environment. The 95% confidence interval for this mean was 3.97 to 1.93. Therefore, overall low self-regulator learner experience in the classroom learning environment regardless of the type of the environment would be positive.

In order to look at the difference between both type of learners on learner experience with the environment, an ANOVA was conducted on the data, and the results showed a main effect of the self-regulation, ($F=133.873$; df 1, 93; $P=0.00$; $\eta2=0.590$) with the high self-regulator learner having higher positive experience than the low self-regulator learner group. This result is presented in table 7 and Fig. 7.

**Table 7:-** The between subject effect of the high and low learner self-regulation by learner experience

| | Sum of Square | df | Mean Square | F | Sig. | η2 |
|---|---|---|---|---|---|---|
| Contrast Error | 5.223 | 1 | 5.223 | 133.873 | .000 | .590 |
| | 3.628 | 93 | .039 | | | |


Fig 7:Main effect of self-regulation by learner experience of the environment.

Interaction of classroom environment by Self-regulation by experience of environment When the analysis of variance involved classroom environment [2: flipped vs. traditional] by self-regulation [2: high vs. low self-regulation] by experience in the environment, the analysis showed a significant interaction of classroom environment by self-regulation ($F=11.272$; df 1, 93; $P=0.001$; $\eta2=0.108$). This interaction is presented in Fig. 8.

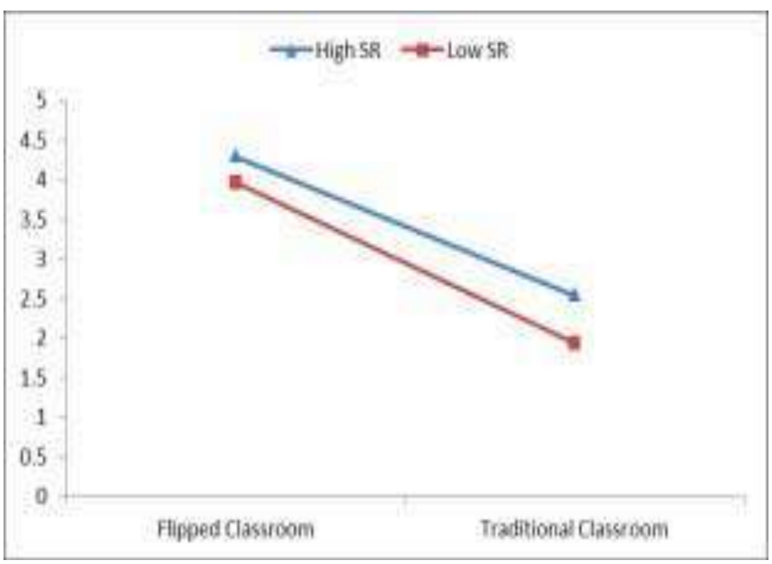


**Fig 8:-** Main interactions of classroom environment by self-regulation by learner experience of the environment.

**Section two: Sense of community**

When the analysis of variance involved classroom environment [2: flipped vs. traditional] by self-regulation [2: high vs. low self-regulation] by learner perceived sense of community, the analysis showed several significant effect. There was an effect of classroom environment (F=1447.190; df 1,93; P=0.00; η2=0.940), and of self-regulation (F=78.133; df 1, 93; P=0.00; η2=0.457), and no interaction of classroom environment by self- regulation (F=1.223; df 1, 93; P=0.272; η2=0.013). These results are presented in the three sections that follow.

**Classroom environment by sense of community:**

The second question of the study states: How do students perceive sense of community in the flipped classroom model? Question two addressed learner perceived sense of community in both traditional and flipped classroom environments. Students in both environments received a 43-item questionnaire after participating in the experiment for measuring their perceived sense of community with the environment. A Likert-type scale of five possible responses, spanning from strongly agree to strongly disagree, was used. The scale for two questionnaire items (items eight and nine) were reversed to maintain consistency in the scales of the variables. Scores ranged from 1 to 5, with scores ranging from 1 to below 2.5 were considered as low self-regulator learners whereas scores ranging from 2.5 and above were considered as high self-regulator learners.

The average mean score for learner perceived sense of community in the flipped classroom environment scale (M=4.03, SD=0. 41), showed that, overall, participants had high and positive sense of community in the flipped classroom environment. The 95% confidence interval for this mean was 3.99 to 4.149. Therefore, overall participant feelings of community in the flipped condition would be positive. The average mean score for the feelings of community in the traditional classroom environment scale (M=1.7985, SD=0.34465), showed that, overall, participants had low and negative feelings in the traditional classroom environment. The 95% confidence interval for this mean was 1.6217 to 2.0735. Therefore, overall participant perceived sense of community in the traditional condition would be negative. Overall, learners in the flipped classroom environment showed more positive sense of community with the flipped classroom than with the traditional classroom environment.

In order to look at the difference between both environments on learner perceived sense of community with the environment, an ANOVA was conducted on the data, and the results showed a main effect of the classroom environment, (F=1447.190; df 1, 93; P=0.00; η2=0.940) with the flipped classroom group having higher positive feelings of community than the traditional classroom group. This result is presented in table 8 and Fig. 9.

**Table 8:-** The between subject effect of the classroom environment by learner sense of community

| | Sum of Square | df | Mean Square | F | Sig. | η2 |
|---|---|---|---|---|---|---|
| Contrast Error | 115.394 | 1 | 115.394 | 1447.190 | .000 | .940 |
| | 7.415 | 93 | .080 | | | |

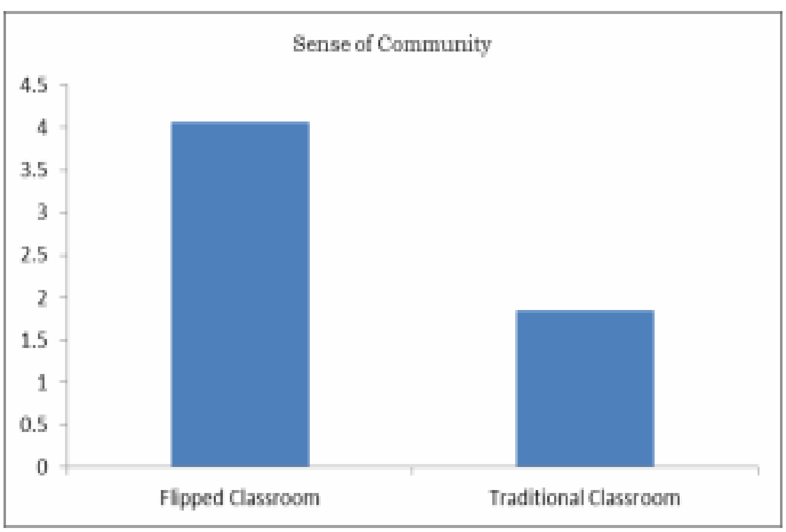


**Fig 9:-** Main effect of classroom environment by learner perceived sense of community.

**Self-regulation by sense of community:**

Question five of the present study states: Do student perceived sense of community as measured by sense of community scale be affected by learner levels of self-regulation? Question five addressed whether student sense of community would be affected by level of learner self-regulation. Learners were classified into high and low self-regulator based on a 55-item scale. A Likert-type scale of five possible responses, spanning from strongly agree to strongly disagree, was used. The total score on the measurement was calculated based on student response on the 55 items included. Scores ranged from 1 to 5, with scores ranging from 1 to below 2.5 were considered as low self-regulator learners whereas scores ranging from 2.5 and above were considered as high self-regulator learners.

The average mean score for learner perceived sense of community with the high self-regulator learners on the scale (M=3.217, SD=1.19), showed that, overall, participants had high and positive sense of community when they were highly regulators. The 95% confidence interval for this mean was 3.128 to 3.306. Therefore, overall participant feelings of community with high self- regulator students would be positive. The average mean score for the feelings of community with the lower self-regulator learners on the scale (M=2.701, SD=1.12), showed that, overall, participants had low and but still positive feelings when they were lower in self-regulator strategies. The 95% confidence interval for this mean was 2.626 to 2.775. Therefore, overall participant perceived sense of community with the lower self-regulator learners would also be positive. Overall, high learners in self-regulation strategies showed more positive sense of community than those with lower self-regulation strategies In order to look at the difference between both type of learners on learner perceived sense of community, an ANOVA was conducted on the data, and the results showed a main effect of the self-regulation, ($F=78.133$; df 1, 93; $P=0.00$; $\eta2=0.457$) with the high self-regulator learner having higher positive sense of community than the low self-regulator learner group. This result is presented in table 9 and Fig. 10.

**Table 9:-** The between subject effect of the high and low learner self-regulation by sense of community.

| | Sum of Square | df | Mean Square | F | Sig. | η2 |
|---|---|---|---|---|---|---|
| Contrast Error | 6.230 | 1 | 6.230 | 78.133 | .000 | .457 |
| | 7.415 | 93 | .080 | | | |

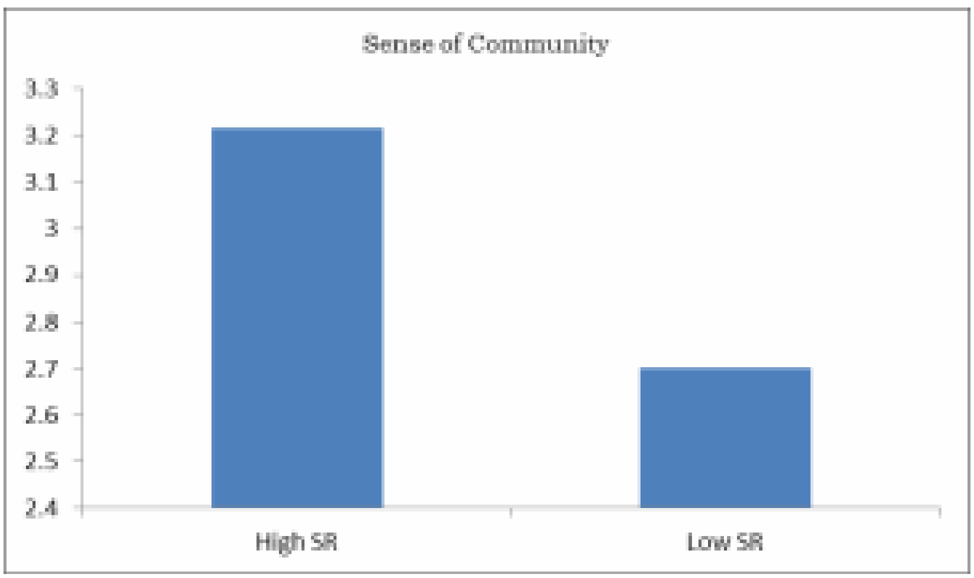


**Fig 10:-** Main effect of learner self-regulation by learner perceived sense of community.

**Interaction of classroom environment by self-regulation by sense of community:**

Interaction of classroom environment by self-regulation by sense of community When the analysis of variance involved classroom environment [2: flipped vs. traditional] by self-regulation [2: high vs. low self-regulation] by learner perceived sense of community, the analysis showed no significant interaction of classroom environment by self-regulation ($F=1.223$; df 1, 93; $P=0.272$; $\eta2=0.013$). This finding is presented in Fig. 11.

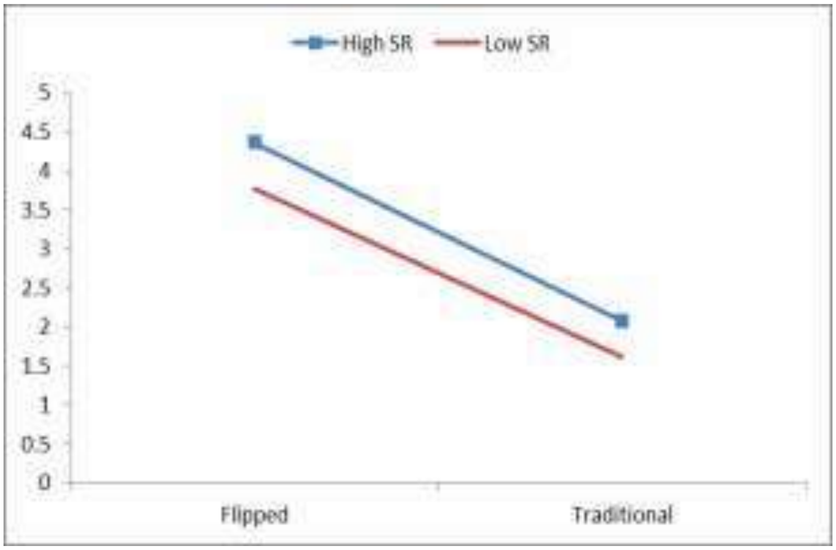


**Fig 11:-** Interaction of classroom environment by learner self-regulation by learner perceived sense of community.

**Section three: E-Learning Projects Performance**

When the analysis of variance involved classroom environment [2: flipped vs. traditional] by self-regulation [2: high vs. low self-regulation] by e-learning projects performance, the analysis showed several significant effect. These results are presented in the three sections that follows:

3.1. Classroom environment by e-learning projects performance
3.2. Self-regulation by e-learning projects performance
3.3. Interactions of classroom environment by self- regulation by e-learning projects performance

**Classroom environment by e-learning projects performance:**

The third question of the study states: Do e- learning projects performance as measured by e- learning rubrics be affected by the flipped classroom model? Question three addressed e- learning projects performance in both traditional and flipped classroom environments. Students in both environments were requested to submit three individual e-learning projects (a website, an electronic blog, and a PowerPoint presentation) and their performance were assessed using 3 rubrics. The rubrics assessed students' projects based on a four-point item Likert scale, ranging from unsatisfactory to excellent. Students were evaluated according to these rubrics and the final grade on each individual project would be ranged from need work (when the project was not accepted), developing (when the project needed amendments), meets standards (when the project fulfilled the requirements of the standards), and above standards (when the project was excellent and creative).

In order to look at the difference between both environments on e-learning projects performance, an ANOVA was conducted on the data for each project and for the total scores on all the three projects, and the results showed a main effect of the classroom environment, ($F=204.009$; df 1, 93; $P<0.000$; $\eta 2=0.687$) with respect to the website project, and a main effect of classroom environment ($F=1447.190$; df 1, 93; $P=0.00$; $\eta 2=0.940$) with respect to the blog project, and a main effect of classroom environment ($F=1447.190$; df 1,93; $P=0.00$; $\eta 2=0.940$) with respect to the PPT project, and a main effect of environment ($F=1447.190$; df 1, 93; $P=0.00$; $\eta 2=0.940$) with respect to the total e-learning projects performance.

**Classroom environment by website project performance:**

Results of the one-way analysis of variance of classroom environment showed that on the rubric measure of website project performance, there was a main effect of classroom environment ($F=204.009$; df 1, 93; $P<0.000$; $\eta 2=0.687$). Table 10 shows the between subject effect of the classroom conditions on student website project.

**Table 10:-** The between subject effect of classroom environment by website project performance.

| | Sum of Square | df | Mean Square | F | Sig. | η2 |
|---|---|---|---|---|---|---|
| Contrast Error | 23.745 | 1 | 23.745 | 204.099 | .000 | .687 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | 10.820 | 93 | .116 | | | |

When looking at the scores given to subjects based on evaluating the website, the raw scores showed that the scores for the flipped classroom group ranged from 34.563 to 35.882 but for the traditional classroom group ranged from 22.117 to 23.526, which means that project performance of the flipped classroom group met standards but below the standard and needed developing for the traditional classroom group. In order to see if this indicates a significant difference, a Post hoc comparison of Sheffe test (based on an alpha of .05) revealed that the flipped classroom group (M=2.83, SD=0.56) scored significantly higher than the traditional classroom group (M=1.69, SD=0.90), and this is shown in Fig.12.

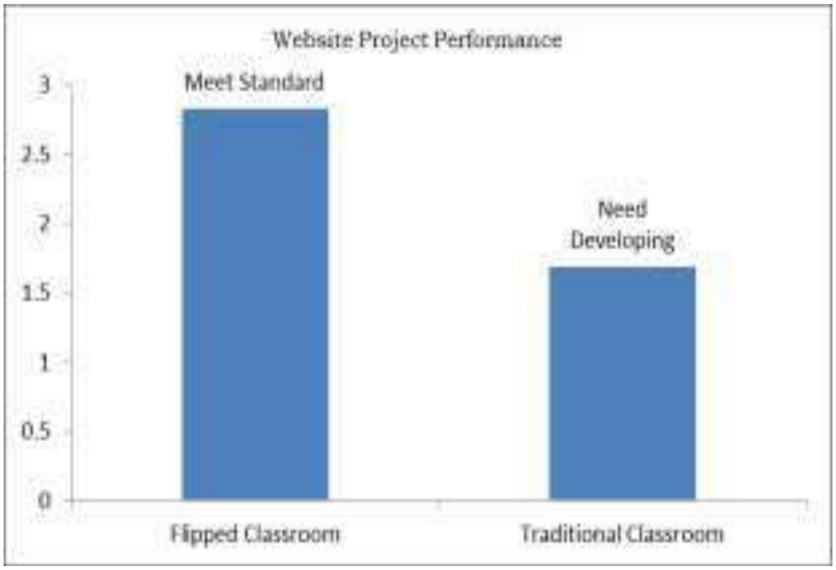


**Fig 12:-** Main effect of classroom environment by website project performance.

**Classroom environment by blog project performance:**
Results of the one-way analysis of variance of classroom environment showed that on the rubric measure of blog project performance, there was a main effect of classroom environment (F=111.064; df 1, 93; P<0.000; η2=0.544). Table 11 shows the between subject effect of the classroom conditions on student blog project.

**Table 11:-** The between subject effect of classroom environment by website project performance.

| | Sum of Square | df | Mean Square | F | Sig. | η2 |
|---|---|---|---|---|---|---|
| Contrast Error | 7.194 | 1 | 7.194 | 111.064 | .000 | .544 |
| | 6.024 | 93 | .065 | | | |

When looking at the scores given to subjects based on evaluating the blog, the raw scores showed that the scores for the flipped classroom group ranged from 17.256 to 18.114 but for the traditional classroom group ranged from 13.895 to 14.811, which means that project performance of the flipped classroom group met standards but below the standard and needed developing for the traditional classroom group. In order to see if this indicates a significant difference, a Post hoc comparison of Sheffe test (based on an alpha of .05) revealed that the flipped classroom group (M=2.9, SD=0.41) scored significantly higher than the traditional classroom group (M=2.392, SD=0.43), and this is shown in Fig.13.

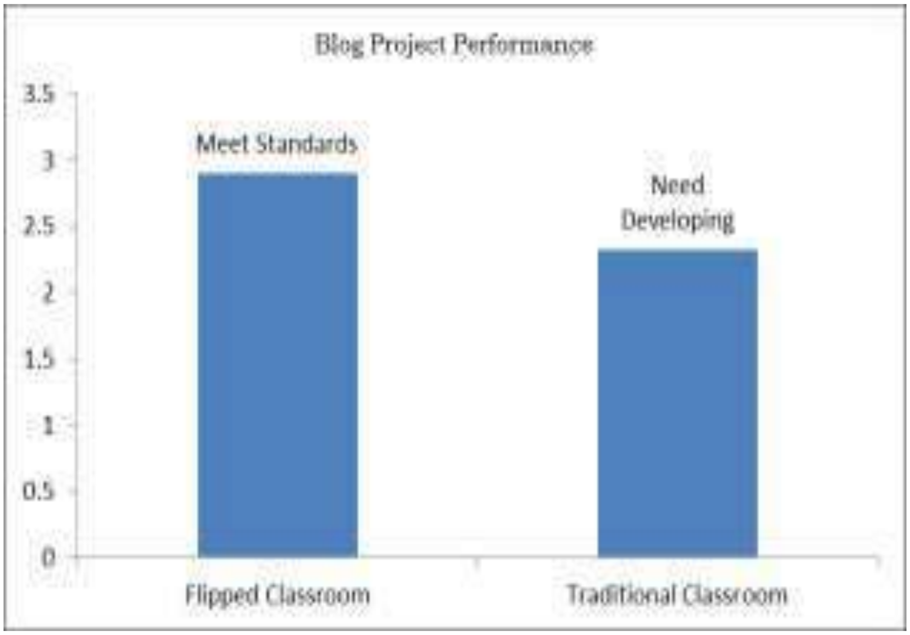


**Fig 13:-** Main effect of classroom environment by blog project performance.

**Classroom environment by PowerPoint presentation project performance**

Results of the one-way analysis of variance of classroom environment showed that on the rubric measure of PowerPoint (PPT) presentation project performance, there was a main effect of classroom environment (F=149.215; df 1, 93; P<0.000; η2=0.616). Table 12 shows the between subject effect of the classroom conditions on student PPT project.

**Table 12:-** The between subject effect of classroom environment by PPT project.

| | Sum of Square | df | Mean Square | F | Sig. | η2 |
|---|---|---|---|---|---|---|
| Contrast Error | 5.848 | 1 | 5.848 | 149.215 | .616 | .616 |
| | 3.645 | 93 | .039 | | | |

When looking at the scores given to subjects based on evaluating the PPT presentation, the raw scores showed that the scores for the flipped classroom group ranged from 19.635 to 20.636 but for the traditional classroom group ranged from 15.098 to 16.167, which means that project performance of the flipped classroom group met standards as well as for the traditional classroom group, performance met standards. In order to see if this indicates a significant difference, a Post hoc comparison of Sheffe test (based on an alpha of .05) revealed that the flipped classroom group (M=2.20, SD=0.34) scored significantly higher than the traditional classroom group (M=1.64, SD=0.45), and this is shown in Fig.14.

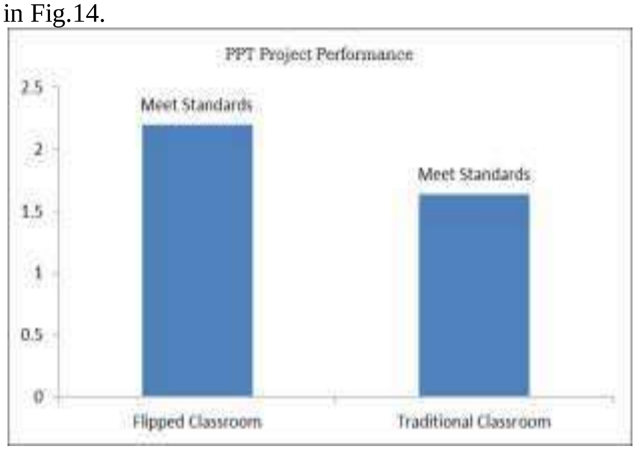


**Fig 14:-** Main effect of classroom environment by PPT project performance.

**Classroom environment by Average:**
Total e-learning projects performance Results of the one-way analysis of variance of classroom environment showed that on the three rubric measures of e-learning project performance, there was a main effect of classroom environment (F=389.146; df 1, 93; P<0.000; η2=0.807). Table 13 shows the between subject effect of the classroom conditions on student total e-learning projects performance.

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**Table 13:-** The between subject effect of the high and low learner self-regulation by sense of community.

| | Sum of Square | df | Mean Square | F | Sig. | η2 |
|---|---|---|---|---|---|---|
| Contrast Error | 99.470 | 1 | 99.470 | 389.146 | .000 | .807 |
| | 23.772 | 93 | .256 | | | |

When looking at the scores given to subjects based on evaluating the three e-learning projects, the raw scores showed that out of 100 % (99 points total scores of the three projects), the average percentage of scores for the flipped classroom group ranged from 72.755 % to 74.811% but for the traditional classroom group the average percentage ranged from 52.245 % to 54.442 %, which means that the total e-learning projects performance of the flipped classroom group met standards but for the traditional classroom group, performance did not meet standards, but projects submitted needed developing. In order to see if this indicates a significant difference, a Post hoc comparison of Sheffe test (based on an alpha of .05) revealed that the flipped classroom group (M=7.93, DS=1.13) scored significantly higher than the traditional classroom group (M=5.65, SD=1.66), and this is shown in Fig.15.

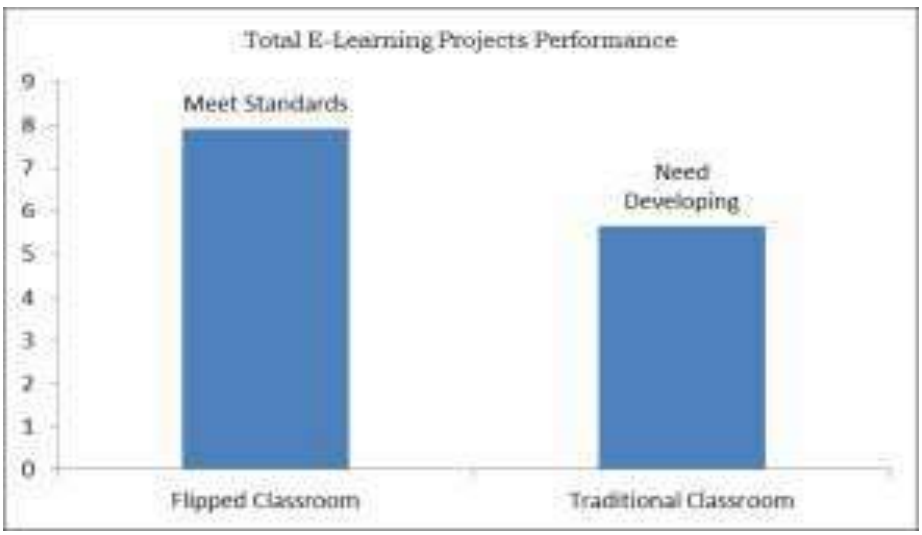


**Fig 15:-** Main effect of classroom environment by total e- learning projects performance.

**Self-regulation by e-learning projects performance**

**Self-regulation by e-learning projects performance**

The sixth question of the study states: Do e- learning projects performance as measured by e-learning rubrics be affected by learner level of self- regulation? Question six addressed whether e- learning projects performance would differ with respect to learner self-regulation strategies.

When the analysis of variance (ANOVA) was conducted on the data with the self-regulation as the independent variable and the e-learning projects performance as the dependent variable, the results showed a main effect of self-regulation, (F=319.330; df 1, 93; P<0.000; η2=0.774) with respect to the website project, and a main effect of self-regulation (F=164.784; df 1, 93; P<0.000; η2=0.639) with respect to the blog project, and a main effect of self-regulation (F=272.473; df 1, 93; P<0.000; η2=0.746) with respect to the PPT project, and a main effect of self-regulation (F=624.083; df 1, 93; P<0.000; η2=0.870) with respect to the total e-learning projects performance.

**Self-regulation by website project performance**

Results of the one-way analysis of variance of level of self-regulation showed that on the rubric measure of website project performance, there was a main effect of self-regulation (F=319.330; df 1,93; P<0.000; η2=0.774). Table 14 shows the between subject effect of the level of self-regulation on student website project performance.

**Table 14:-** The between subject effect of self-regulation by website project performance.

| | Sum of Square | df | Mean Square | F | Sig. | η2 |
|---|---|---|---|---|---|---|
| Contrast Error | 37.151 | 1 | 37.151 | 319.330 | .000 | .774 |
| | 10.820 | 93 | .116 | | | |

When looking at the scores given to subjects based on evaluating the website, the raw scores showed that the scores for the high self-regulation group ranged from 35.395 to 36.877 but for the low self-regulation group ranged from 21.290 to 22.525, which means that project performance of the higher self-regulator learner group met standards but below the standard and needed developing for the lower self-regulator learner group. In order to see if this indicates a significant difference, a Post hoc comparison of Sheffe test (based on an alpha of .05) revealed that learners with high self-regulation strategies (M=3.0372, SD=0.35172) scored significantly higher than learners with low self-regulation strategies (M=1.69, SD=0.85039), and this is shown in Fig.16.


Fig 16:Main effect of self-regulation by website project performance.

**Self-regulation by blog project performance**

Results of the one-way analysis of variance of level of self-regulation showed that on the rubric measure of blog project performance, there was a main effect of self-regulation (F=164.784; df 1, 93; P<0.000; η2=0.639). Table 15 shows the between subject effect of the level of self-regulation on student blog project performance.

**Table 15:-** The between subject effect of self-regulation by blog project performance.

| | Sum of Square | df | Mean Square | F | Sig. | η2 |
|---|---|---|---|---|---|---|
| Contrast Error | 10.674 | 1 | 10.674 | 164.784 | .000 | .639 |
| | 6.024 | 93 | .065 | | | |

When looking at the scores given to subjects based on evaluating the blog, the raw scores showed that the scores for the high self-regulation group ranged from 17.566 to 18.530 but for the low self-regulation group ranged from 13.588 to 14.392, which means that project performance of the higher self-regulator learner group met standards but below the standard and needed developing for the lower self-regulator learner group. In order to see if this indicates a significant difference, a Post hoc comparison of Sheffe test (based on an alpha of .05) revealed that learners with high self-regulation strategies (M=3.0372, SD=0.38) scored significantly higher than learners with low self-regulation strategies (M=2.34, SD=0.37), and this is shown in Fig.17.


**Fig 17:-** Main effect of self-regulation by blog project performance

**Self-regulation by PPT project performance**

Results of the one-way analysis of variance of level of self-regulation showed that on the rubric measure of PowerPoint (PPT) Presentation project performance, there was a main effect of self- regulation (F=272.473; df 1, 93; P<0.000; η2=0.746). Table 16 shows the between subject effect of the level of self-regulation on student blog project performance.

**Table 16:-** The between subject effect of self-regulation by blog project performance.

| | Sum of Square | df | Mean Square | F | Sig. | η2 |
|---|---|---|---|---|---|---|
| Contrast Error | 10.679 | 1 | 10.679 | 272.473 | .000 | .746 |
| | 3.645 | 93 | .039 | | | |

When looking at the scores given to subjects based on evaluating the PPT presentation, the raw scores showed that the scores for the high self- regulation group ranged from 20.364 to 21.489 but for the low self-regulation group ranged from 14.373 to 15.311, which means that project performance of the higher self-regulator learner group met standards as well as the standards were met with the lower self-regulator learner group. In order to see if this indicates a significant difference, a Post hoc comparison of Sheffe test (based on an alpha of .05) revealed that learners with high self- regulation strategies (M=2.3416, SD=0.27) scored significantly higher than learners with low self- regulation strategies (M=1.6550, SD=0.38), and this is shown in Fig.18.

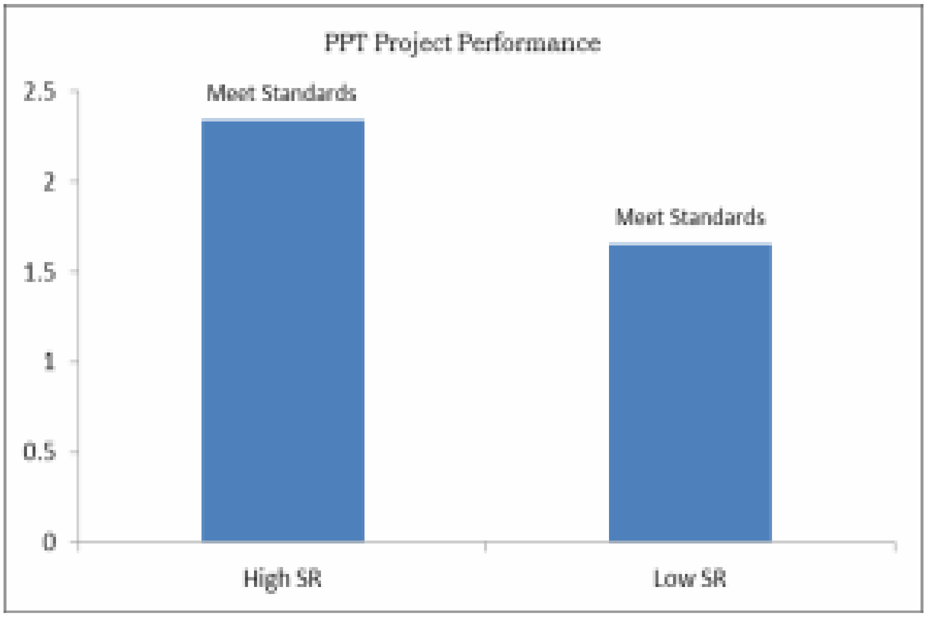


**Fig 18:-** Main effect of self-regulation by PPT project performance.

**Self-regulation by total e-learning projects performance**

Results of the one-way analysis of variance of learner self-regulation showed that on the three rubric measures of e-learning projects performance, there was a main effect of self- regulation (F=624.083; df 1, 93; P<0.000; η2=0.870). Table 17 shows the between subject effect of the self-regulation on student total e-learning projects performance. Table 17: The between subject effect of self-regulation by total e-learning projects performance

**Table 17:-** The between subject effect of self-regulation by total e-learning projects performance

| | Sum of Square | df | Mean Square | F | Sig. | $\eta^2$ |
|---|---|---|---|---|---|---|
| Contrast Error | 159.52 | 1 | 159.523 | 624.083 | .000 | .870 |
| | 23.772 | 93 | .256 | | | |

When looking at the scores given to subjects based on evaluating the three e-learning projects, the raw scores showed that out of 100 % (99 points total scores of the three projects), the average percentage of scores for the high self- regulation group ranged from 74.716 % to 77.027% but for the lower self-regulation group the average percentage ranged from 50.292 % to 52.219 %, which means that the total e-learning projects performance of the higher self-regulator learners group met standards but for the lower self-regulator learners group, performance did not meet standards, but projects submitted needed developing. In order to see if this indicates a significant difference, a Post hoc comparison of Sheffe test (based on an alpha of .05) revealed that learners with higher self-regulator strategies (M=8.4159, S=0.84555) scored significantly higher than learners with lower self-regulator strategies (M=5.7544, SD=1.4590), and this is shown in Fig.19.


**Fig 19:-** Main effect of self-regulation by total e-learning projects performance.

**Interactions of classroom environment by self-regulation by e-learning projects performance.**
When the analysis of variance involved classroom environment [2: flipped vs. traditional] by self-regulation [2: high vs. low self-regulation] by e-learning projects performance, the analysis showed that there was a main interaction of classroom environment by self-regulation (F=47.436; df 1, 93; P<0.000; η2=0.338) with respect to website building, and of classroom environment by self-regulation (F=17.399; df 1, 93; P<0.000; η2=0.158) with respect to PPT project, and of classroom environment by self-regulation (F=35.415; df 1, 93; P<0.000; η2=0.276) with the total e-learning projects performance; but no interaction of classroom environment by self- regulation (F=0.427; df 1, 93; P<0.000; η2=0.515) with respect to blog building,. This finding is presented in Fig. 20.

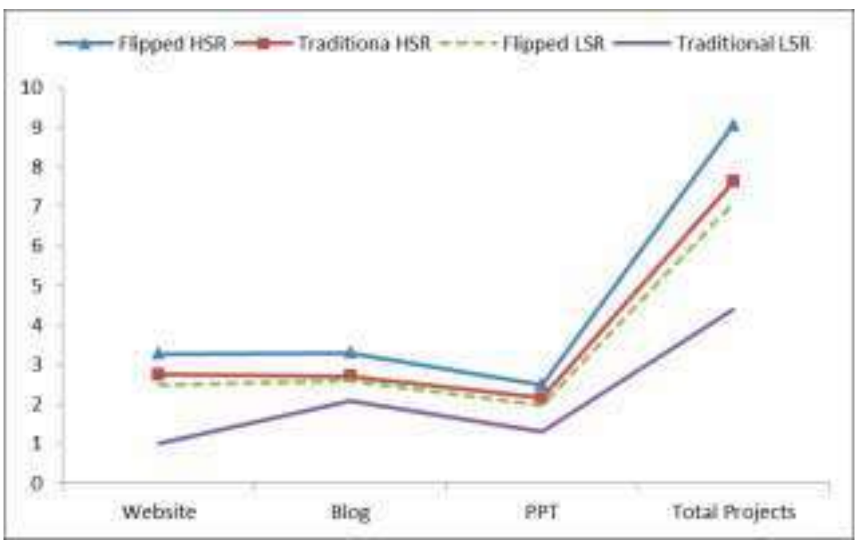


**Fig 20:-** Interaction of classroom environment by learner self-regulation by e-learning projects performance.

## Discussion Of Findings:-
This section presents the discussion of results and the focus of the discussion will be in the light of questions and hypotheses of the study. The discussion will be presented in two sections based on the independent variables:

**Effect of classroom learning environment**

This study sought to determine if there was any significant difference in experience and perceived sense of community gained by students exposed to the flipped classroom model as opposed to the traditional classroom model. The study was also designed to investigate if there was any significant difference between students who studied by the flipped classroom model as opposed to those who studied by the traditional classroom model in e-learning projects performance. Hypotheses one to three predicted that there would be no significant differences at $\alpha$=.05 in the experience gained, perceived sense of community and e-learning projects performance of flipped classroom model as compared to traditional classroom model.

The study was accomplished over ten weeks' period with actual study lasting nine weeks and one week at the start was used as an introduction traditional session for both groups. One course had the material delivered through traditional lecture with traditional homework assigned to reinforce the concepts while the other watched videos instead of lecture and spent time in class working through activities in a collaborative manner and participating in peer learning conceptual discussion questions and variety of activities. The gained learning experience and students' perceived sense of community were measured through questionnaires and e-learning projects performance was measured through three e-learning project rubrics. Analysis of the data collected from these three sources of measurements indicated that there was a statistically significant difference in the two types of classroom environments in favor of the flipped classroom model.

The results of the study showed several significant differences on the study measurements. First, a main effect of the classroom environment was found on the experience of classroom scale, with the flipped classroom group showing more positive experience but for the traditional classroom group experience in the classroom environment was negative and below the average mean. Based on this finding, hypothesis one was not supported. Second, perceived sense of community was found to be high and positive with the flipped classroom group whereas lower and negative for the traditional classroom group. The results in the sense of community measure did not support the second hypothesis. Third, the e- learning projects performance for the flipped classroom group was found to meet standards and had fulfilled the criteria designed for evaluation whereas the traditional classroom group submitted e-learning projects that needed developing and were below the satisfactory level. Based on the results on the e-learning projects performance, hypothesis three was not supported.

As Arabic countries education shifts from the traditional method of instruction to a more communicative environment, it is important that Arabic countries consider the flipped classroom as a teaching model. This study has shown that the students' experience in the flipped classroom is positive and they found these teaching strategies beneficial to their learning and performance. Participants witnessed dramatic increase in collaboration, communicative use of their skills, and their awareness of their improvement in e- learning projects. Participants recognized that the learning environment had changed, and passively sitting and taking notes was no longer the norm; instead, participants needed to take an active role, to be in charge of their learning. This change inspired participants to find ways to communicate outside class, comes prepared, use in class-time more effectively, evaluate classmates' work, learn from others, and apply this new learning to their own e-learning projects or presentation. The classroom became a collaborative work environment where e-learning concepts, ideas and skills were used in actual learning situations and participants strived to improve. Even though participants commented that they enjoyed learning in this format they did mention the increased workload as a negative aspect of the class. This is one point that needs to be taken in consideration because it could cause students to become disinterested in learning.

The flipped classroom environment increased student perceived sense of community. It was suggested that sense of community is a feeling that members of the groups have of belonging, a feeling that members matter to one another and to the group, and a shared faith that members' needs will be met through their commitment to be together (MchMillan & Chavis, 1986, p. 9). In the flipped classroom, a feeling of belonging which is a person identified himself as a part of a group probably was created. Each person in the group may have felt that he had some sort of effect on the group and the reverse was probably true with the feelings that the group had an effect on each person possibly was realized. In a collaborative flipped classroom environment, the social community may have affected the person response, discussion, and engagement which might have increased the perceived sense of community of the students. High perceived sense of community in the flipped environment may indirectly have some sort of effect in students' perceptions and experience in the environment. With lower feeling of sense, as in the traditional classroom environment, students' perceptions and experience probably became negative. Previous studies have indicated that the social environment have powerful influence on student sense of community. Dawson (2006) found that students felt a stronger sense of community when they interacted with each other to a greater extent. Shea (2006) found that students who felt that the instructors who directly facilitated the student interaction by acknowledging consensus and disagreement of the students had positive outcome such as a welcoming atmosphere for participation, and avoiding potential deviation increased sense of community among students. Also because the flipped classroom enabled learners to engage in small group activities this may have increased sense of community. In traditional classroom, students attended lecture with the whole class, a large group consisting of 25 participants, each student may have felt that isolation created and prevented them from interaction with their peers and instructor whereas in the flipped classroom, small groups were created making more interaction was possible. This difference in group size was possibly the most important factor affected the feeling of a community and the most important factor may have affected student experience with the classroom environment. Therefore, it was expected based on the group size structure that the flipped classroom environment would promote more sense of community among participants whereas with traditional environment, less sense of community would be likely to appear. Studies have revealed that an important factor affecting sense of community is the group size (Lou, Abrami, & D'Apollonia, 2001). Sense of community also was found to affect performance and academic achievement. In a study by Goodenow (1993), academic achievement and motivation was related directly to students' sense of community and sense of belonging.

**Effect of self-regulation**

This study sought to determine if there was any significant difference in experience and perceived sense of community gained by high and low self- regulation students regardless of the classroom environment whether flipped classroom or traditional classroom. The study was also designed to investigate if there was any significant difference between students who had high self-regulation strategies as opposed to those who had low self- regulation strategies in e-learning projects performance. Hypotheses from four to six predicted that there would be no significant differences in student experience, perceived sense of community and e-learning projects performance between learners of high and low self-regulation strategies.

Learners were classified into high and low self- regulator based on a 55-item scale. A Likert-type scale of five possible responses spanning from strongly agree to strongly disagree was used. The total score on the measurement was calculated based on student response on the 55 items included. Scores ranged from 1 to 5, with scores ranged from 1 to below 2.5 considered as low self- regulator learners whereas scores ranged from 2.5 and above were considered as high self-regulator learners.

With respect to the experience of classroom environment, the results showed that high and low self-regulator students had positive experience of classroom environment regardless of the environment. However, students who had high self- regulation strategies showed more positive experience than those who had low self-regulation strategies. This result did not support hypothesis four. With respect to the sense of community, a similar pattern was observed with the overall perceived sense of community being positive for both types of learners. However, students with high self-regulation strategies had higher feelings of sense of community than those with low self- regulation strategies. Based on this result, hypothesis five was not supported. As for the e- learning projects performance, the results indicated a major effect of self-regulation on individual e-learning projects and the total project in favor of the highly self-regulator learners. The results in the e-learning projects performance here did not support hypothesis six. Taking together all findings on the whole dimension’s measurements; one pattern could be shown with the superiority of the high self-regulation learners over the low self- regulation learners. These may mean that having had autonomy and control of strategies in learning was a powerful factor in enhancing positive learner experience and positive sense of community in the learning environment as well as this may have had an effect on student e-learning performance. Learners with highly self-regulator strategies seems to have several learning strategies such as memory strategies, goal setting strategies, self-evaluation strategies, seeking assistance strategies, learner responsibility strategies, and many other strategies. These different strategies may have encouraged them to better interact with the content, with the instructor, and with their peers, and the results were more positive feelings of community and had positive experience with the environment. These positive experiences and feelings of community may have had an effect on learning performance and have resulted in better e- learning projects performance.

In terms of the motivation to learning, high self- regulation learners are more self-motivated, their choice of how much to study for the outclass activities and involvement in in-class activities are self-controlled and intrinsically motivated to do these activities. These personal motivations and control and choice are in reality important factors to interact with other to form a community and an important factor in perception of their environment. That is why highly self-regulator learners had more positive experience in the learning environment and more feeling and sense of community. With respect to the method of instruction, highly self-regulator learners are more organized and planned persons who are based their planning and strategies on an analysis of the requirements of the learning tasks. Times to interact with other, time for performing tasks, time for though, time for doing an activity were all required strategies for learners to be self- regulators. Highly self-regulator learners are mostly employing different time management techniques for completing and performing the learning tasks. From a social viewpoint, highly self-regulator learners are better able to find their people in the social environment; those who can help them and assist them, and contribute to the performance of the learning goals. High regulator learners know how and from who to seek help when they encountering learning problems; with their autonomy they are able to seek appropriate help for others.

**Implications For Classroom Learning & Design**

The results of this study have several implications for instruction and learning. There are some direct applications of the results in classroom environment and teaching and there are others could be inferred from the findings.

The flipped classroom used in the present study emphasizes a student-centered learning environment. After all, the goal of teaching is not simply cover all course material but rather for the student to absorb the material, synthesize it with their experience, and repackage it in ways that are highly relevant to them and their future careers. An important implication is that flipping a course can help students to move in that direction. The instructor becomes a facilitator of in-class problem solving. Students can self-pace their learning; some students might require a longer period of time to process and comprehend the material relative to their peers. Hence, this approach accommodates individual differences present in the background of the class. Finally, students learn to self-monitor their progress. If they are not able to engage fully in the small group activities because their progress falls behind their peers, they realize they need to perform additional work prior to the class period. The instructor can also address their needs and questions on an individual basis, without delaying the rest of their group or the rest of the class.

Another important implication comes from the results is that the instructor role. In the present study, the role of the instructor shifts from conveyer of information to one who responds to individual and group questions and guided in-class activities such as problem solving. Instructor should strive to create a positive classroom environment where students feel safe to ask any question and where they can expect to receive clarifying responses to these questions. This may directly enhance positive experience for students in the classroom and more feeling of a connection to a group and higher positive sense of community will be established. If an instructor is more interested in the students' correct reasoning than in their ability to simply produce correct responses without fully comprehending the underlying concepts, the flipped format can facilitate students' engagement with the material in that manner. Students will quickly learn that they are responsible for the prerecorded material when the instructor does not remodel the material in class.

By assigning individual work prior to assembling their students into small groups; each individual will spend time thinking deeply about the material and integrating the new knowledge with his or her existing beliefs before engaging in discussion with his or her peers. Two such individual based possibilities are (a) the think-pair share approach, where students think through an exercise before pairing with another student and share their thoughts, and (b) distributing an ungraded quiz that allows students to formulate their argument and then in turn convince the members of their small group that their response is correct.

The notion of the flipped classroom is a transformative teaching and learning experience that can open the doors to greater level of achievement, which may not have been intensively used in a traditional format. Although the instructor needs to maintain a high degree of flexibility in class, it comes at a great benefit of tailoring the needs of a particular set of students.

Several challenges associated with this approach exist, but these can be overcome by the instructor's planning and by keeping the intended goal of enhanced student learning in mind.

The instructor indeed has more positive roles in the flipped classroom so it is essential for the instructor to be highly organized in his or her approach to the flipped classroom. This is not only because so many different activities occur in a given class period but also because students may require scaffolding to successfully connect together all the material for a given topic. Further, a considerable time burden associated with the implementation of the flipped classroom exists; although this can be viewed as a long-term investment that pay off over time. This flipped classroom requires an instructor to deeply exercise this form and to have flexibility necessary y to modify the class period according to the observed needs of the students.

More importantly is the class organization and group structure in the flipped classroom. The small group activities are critically important pieces of the flipped course. Hence, finding the right composition of the group is essential not knowing the background of each student, an instructor may need to adjust and reorganize the membership of each group for the class period multiple time until the right mix is found. The mix of the group members can address the challenge of having students in both tails of the distribution curve regarding their level of understanding. The stronger students will ideally serve as peer instructors to those who need additional explanation. Also, the stronger students, of course, benefits from this activity, as forming and expressing their thoughts in ways their peers can understand will further solidify their understanding.

## Conclusion:-

To conclude, the present study was designed to reveal the effect of the flipped classroom model on learner experience, sense of community and e- learning projects performance with a group of students who studying an e-learning applications course in the Faculty of Education- Baha University in KSA. Student self-regulation was also considered as a moderating variable and was investigated with the same independent variables. Overall, based on the results of the study, the main conclusion is that the flipped classroom environment has a powerful effect on student perceived experience of the environment, sense of community and e-learning performance. It can be concluded that more positive experience and higher sense of community may be gained when the instructor flips the classroom. Further, e-learning projects performance may be enhanced accordingly as a result of flipping the classroom. Positive experience overall and higher sense of community as well as better e-learning projects performance can be gained when the leaners are highly self- regulators. Future studies should be cautious when trying to implement the same study because of the small size of the sample and type of the learning task and types of the students.

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