Goal-orientation, epistemological beliefs towards intrinsic motivation among engineering students: A review

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Abstract. An aspect that has been exhaustively researched in the motivation of the higher education discipline is the engineering students’ process of goal-orientation, epistemological beliefs towards intrinsic motivation. However, the focus of those researchers as commonly the influence of goal orientations and epistemological beliefs on intrinsic motivation; they have not combined the two factors and examined relationships among goal orientation, epistemological beliefs, and intrinsic motivation. Therefore, although there is a plethora of research on the matter in related disciplines, the researchers commonly do not have consensus on a term that could be used to discuss how engineering students are motivation. This paper identifies literature whose characteristics have focused on the concept of motivation. Attempts were made to retrieve related literature empirically examined motivation, extrinsic motivation, Goal orientation, Epistemological beliefs, and intrinsic motivation to gain insight information. It is believed that the present study may help educators in organizing content, preparing curriculum, and evaluate student tasks, so that students can begin to develop more mature and effective epistemological beliefs and design their proper goals for their learning process.

1. Introduction

The demand for engineers is high as engineers remain atop employers’ lists of hard-to-fill jobs. Despite numerous attempts to increase enrolments; the number of engineering graduates has decreased over the past 20 years [1]. It is a significant challenge among engineering educators to increase the number of engineering graduates as the etiology associated with persistence are complex and not well understood [2-5]. Furthermore, according to complicating the issue, retention within an engineering curriculum does not necessarily guarantee persistence into an engineering career [6]. To address this need, researchers have examined many factors that affect postgraduate engineering students’ achievement and persistence. However motivation has been under researched according to researcher knowledge.

Motivation is a noteworthy issue in psychological studies, it is the core of most our behaviors and research as it explores the components that prescribe, guide or perpetuate behaviors [7]. Motivation may vary in degree per the context, which means that different individuals will be intrigued by taking
part in an action or to obtain a particular objective by using different ways. It might also differ between people as a broader quality [8-9]. According to [10] one common method to differentiate between various sorts of motivation is to talk about internal and external motivation, because motivation not only varies in degree, but also differs in kind.

Throughout the first half of the 20th century, most psychological studies on motivation, emphasized primarily on external motivation, investigating how diverse sorts of reinforcements change our actions and behaviors [4, 6]. From that point onwards, a significant amount of studies has been conducted to examine intrinsic motivation from various viewpoints. Intrinsic motivation is active involvement or participate in an activity that highlighted that motivational condition of interest, curiosity and enjoyment and make a learning process effective and efficient [11-14].

During the past three decades, most of the studies regarding intrinsic motivation has emerged. Most of these reports have different factors that support or undermine intrinsic motivation. For instance, [15] investigated the influences of diverse components of the competitive circumstances on intrinsic motivation levels. Similarly, another study examined the direct relationship between positive and negative feedback provided after a task on intrinsic motivation. In addition, [16] examined the influences of social support on intrinsic motivation, and the results showed that social support from parents, siblings, peers and teachers significantly influenced intrinsic motivation. [17]; found that student-centered and technology-based instruction can improve intrinsic motivation. Lastly, the curiosity and external regulation can predict intrinsic motivation among the students [18].

During recent years, the goal orientation approach to intrinsic motivation has turned to the dominating conceptual framework, particularly for conducting research about the behavior of learners, sports people and employees [13]. According to [19], goals orientation is generally defined as the reason for an individual’s pursuits and interests. At first, goal orientation theorists identified two goals, namely mastery goal and performance goal. Along these lines, in an educational setting, the types of academic goals followed by the students are amongst the most fundamental variables within motivational research settings.

Goal orientation refers to the interaction of motivational-convictions which embody diverse styles of participating in an activity and reacting to achievement [20]. Goal-orientation is students concentrate on leaning acquisition, mastery experience, effective learning engagement towards challenging tasks, and see failure and achievement input as experiences or information to enhance their future academic performance and development. On the other hand, students who concentrate on a performance goal to show their capacities to accomplish tasks, compared well to their peers, and receive positive feedbacks and evaluation from others around them, and they seek to perform effectively to demonstrate higher level of their abilities [21]. Goal orientation stresses the reasons for which a person engages in an activity for his or her own sake [22]. Accordingly, students hold personal goals which serve as reasons or factors for participating in the learning activity. According to [22], students who are centered on showing their abilities to others and define their efficiency in relation to others are thought to be holding a performance goal orientation, while those who want to abstain from looking as incomplete are thought to be holding a performance-avoidance goal orientation.

Research results have highlighted that intrinsic motivation and goals orientation are significant attributes that played a crucial role towards students’ academic achievement [23]. Similar findings were revealed by [24]; in their two experimental studies to examine the direct relations between the proposed three goals orientation approaches and intrinsic motivation and the mediation process of these relations, found that both experiments indicated the predictive utility of the proposed dichotomous goal orientation framework. Performance-avoidance goal undermine intrinsic motivation while both mastery goal and performance goal increased the levels of intrinsic motivation [13]. Additionally, mastery goal orientation and intrinsic motivation are found to be positively associated, while performance goal orientations have been associated with extrinsic motivation [25].

Conversely, in research literature for student learning and motivation there is growing recognition of the importance of learners’ epistemological beliefs [26-27]. Epistemological beliefs, which are
personal attributes, are the beliefs that individuals have in connection to the nature of knowledge and to the acquisition of this knowledge [28]. According to [26], epistemological beliefs include the perceptions of students about the knowledge definition, how to construct knowledge, how to evaluate knowledge, where knowledge is located, and how knowing happens [29]. Epistemological beliefs form a system of beliefs containing five dimensions, such as the source of knowledge, structure of knowledge, stability of knowledge, progress and speed of learning, and monitor of learning. These dimensions are considered independent of each other [27].

Researchers argue that students’ beliefs about the nature of knowledge and learning are linked to motivation, strategy used, conceptual change, and academic performance of those students [30]. These relationships are also observed among Asian students, where epistemological beliefs have been related to the essential aspects of student learning like learning approaches, motivation to learn, studying, and use the technology for learning [31]. Other research has focused on how students’ epistemological beliefs are associated with various types of motivational constructs such as intrinsic motivation, goal orientation and self-efficacy. [32]; revealed that a direct effect of students’ epistemological beliefs on their academic achievement, whereby it is also revealed that creating a conducive learning environment along with intrinsic motivation triggers cognitive processes resulted in facilitating the learning. Although research has considered how students differences in epistemological beliefs are related to the variety of their learning outcomes [26] however there are few studies which have examined the relationship between epistemological beliefs and intrinsic motivation, even though intrinsic motivation has long been considered as an essential factor that predicts successful learning outcomes [29, 31-32].

2. Theoretical Foundation

2.1. Achievement goal theory: Goal-orientation

Achievement Goal Theory demonstrates the reasons for learning among the students. Researchers in goal-orientation theory have agreed that these two types (mastery goal and performance goal) are important [33]. According to [20] mastery goal orientation is a desire to promote competence and enhance knowledge and skills during the learning process [34]. The terms of mastery goal orientation and learning goal orientation could be used interchangeably [19, 34]. Additionally, [34] defined the desires to get favourable evaluations from others about one’s competence as performance goal orientation.

Goal orientation is a stable disposition toward enhancing potentials in situational learning. It refers to the desire in developing one’s self in three core features namely acquisition of new skills, mastering cognitive-based knowledge, and enlightening proficiency. Nevertheless, the performance of goal orientation constructs distinguishes between a desire to demonstrate competence and a desire to avoid negative judgments. [35], defined performance prove goal orientation as the desire to prove individual's competence and to avoid negative evaluations about it, while he defined performance avoid goal orientation as the desire to avoid the disproving of individual's competence as well as to avoid negative evaluations about it.

On the whole, the set of student characteristics linked with the learning goal orientations were considered positive in relation to the learners’ characteristics and their performance. Learning-oriented students are potentially intrinsically motivated in their learning and tend to use deep information processing techniques like developing multiple examples of concepts [36]. These students are considered to be self-regulated, using self-monitoring, organizational strategies and adapting themselves to failure in certain tasks. Learning-oriented students tend to seek challenging tasks and activities [19]. Furthermore, they got to be engaged in chosen tasks, spending a great amount of time on conducting their activities [27].

On the other hand, the set of students’ properties related to performance goals were viewed as negative in light of the fact that these properties were not associated with their academic success. According to [19] the main concern of performance-oriented students is not to appreciate the intrinsic
value of their learning process but to outperform others around them, such as their classmates [34]. Performance-oriented learners attribute their successes and failures to stable abilities or challenging tasks, rather than malleable effort, which lead these students to seek better outcomes compared to their classmates with the minimal of effort [36]. The absence or lack of effort led to shallow information processing among those students by using memorization rather than deeper learning approaches such as critical thinking [34]. In addition, attributions of failures to tasks difficulties, prompted the evasion of challenging tasks and learning activities, because the fear of failure or appearing inferior is higher than it should be [19]. According to [36], performance orientations are related to negative attitudes toward class, compared with mastery orientations which correlated with positive attitudes toward class [33].

Goal orientation is a cognitive representation of the purposes or reasons for why the students pursue an achievement task, especially an academic learning task and competence-related learning activities [11]. Achievement goals were originally distinguished into two main types namely learning goal orientation and performance goal orientation. A learning goal orientation refers to orientating students to focus on the task in terms of learning how to do the task or on the development of competence. A performance goal orientation refers to orientating students to focus on performance and competence relative to others, ability, and self.

As indicated by goal orientations theory, learners have various goals when participating in their tasks and the above introduction pointed out that goal orientation approach has an important role within students’ motivation contexts, as well as assuming a successful learning process [11, 19]. For instance, students with a learning goal orientation demonstrate higher levels of intrinsic motivation [36]. Students with a performance goal orientation, on the other hand, show lower levels of intrinsic motivation and avoid challenging tasks [37]. It is suggested that certain attributes of performance goal orientation including fully functioning abilities or self-actualisation tends to positively associated to intrinsic motivation among the students. These conflicting views surrounding the relationship of goal orientation and intrinsic motivation highlight a need for conducting more research to examine the relationship between those two variables and determine which type of goal orientation may be more effective for increasing intrinsic motivation for learning among students. For those reasons, the main purpose of the present study is to examine the relationship between students’ epistemological beliefs, goal orientation and their intrinsic motivation in the learning process among university students.

2.2. Epistemological beliefs
Epistemology refers to a system of relatively independent rather multifaceted construct beliefs including respect to structure, certainty, source, speed, and nature of knowledge. Epistemology is considered as one foundations of philosophy that relates to the origin, nature, limits, approaches and justification of knowledge. The effect of individual beliefs on thoughts and behaviours encourages educators and psychologists to consider beliefs in many categories in regard to the learning and teaching processes. Various theories have highlighted these different beliefs from time to time and have made them the subject of studies in educational contexts. One of these beliefs are epistemological beliefs, which has critical importance and has a significant effect on the behaviours and decisions of the students.

According to [11, 26] research on personal epistemology addresses students’ thinking and beliefs about knowledge and knowing. Accordingly, there are some elements that are typically included in this area of research, such as beliefs about the definitions of knowledge, how knowledge is constructed, how knowledge is evaluated, where knowledge is located, and how knowing occurred. Individual thinking about epistemological concerns has been conceived in different ways. The early researches of epistemology highlighted personal epistemology as an unidimensional which develops in a fixed progression of stages [38]. Other views give way to the notion that epistemology consists of multiple independent dimensions [19, 27]. However, all the models included have related content to the nature of knowledge and the processes of knowing. The nature of knowledge includes what the student believes knowledge is, and this is the basis of most of the models of epistemology [38]. The
nature of knowledge is considered as a progressive understanding which moves from the view of knowledge as absolute to a relativistic view and then to a contextual, and constructivist stance [11], [26]. Additionally, the nature of knowing includes the beliefs about the process by which one comes to know. This involves the beliefs about the source of knowledge and the justification for knowing, which includes the evaluation of evidence, the role of authority, and the process of justification [11], [26].

Epistemological beliefs are often considered a lens through which students interpret information, set standards, and they decide on an appropriate course of action to be taken [11, 26]. Accordingly, several studies have examined epistemological beliefs in relation to different aspects of the student learning process. For instance, [39] indicates that students’ epistemologies influence students’ interpretations of community, engagement in learning process, and the pedagogies aimed at creating both. In line with these assertions, it is also found that attitudes and the ability to adjust to the learning process at colleges of higher education were affected by the students’ set of beliefs about knowledge and the process of teaching and learning. Research has also indicated that higher education help new students with the move their belief systems in line with more experienced students [4]. [39]; examined the relationship between epistemological beliefs of students and their motivational situations to learn. Their results highlighted that sophisticated beliefs in the fields of simple knowledge, quick learning, and fixed ability were significantly related to the motivational constructs of intrinsic goal orientation, extrinsic goal orientation, and task value, control of learning, self-efficacy, and test anxiety among the students. According to [39], students with more sophisticated beliefs toward the complexity of knowledge were more likely to have higher levels in their intrinsic motivation. Students with the naïve belief that the ability to learn is fixed, were less likely to have an intrinsic goal orientation, to appreciate the value of learning tasks, to perceive an internal control during learning process, and to feel efficacious about their ability to learn new knowledge. Additionally, students with a naïve belief in quick learning were also more likely than other students to have an extrinsic goal orientation toward the learning process. Students who believed that knowledge was certain, tended to conduct more rehearsal strategies. Furthermore, it is a strong need to provide a learning environments and settings that enhanced the development of students’ epistemological beliefs in higher education.

Further evidence of the importance of and the need for additional studies on students’ epistemological beliefs is found in studies that examined students’ beliefs and their academic performance. Many researchers [27-28] found that more sophisticated epistemological beliefs were linked to better grades, enhanced test performance, and more sophisticated study strategies by the students [39]. The type of study strategies one chooses and the comprehension of material one gets, depends on the stage or position of epistemological beliefs of a student [27]. In addition, several studies pointed out that students who hold more simplistic beliefs tend to oversimplify conclusions and use simple learning strategies, and that were less likely to believe in quick learning, simple knowledge, and fixed ability performed better on their mastery tests and gained higher outcomes [27-28]. Similarly, [32] have found that well-founded beliefs on knowledge acquisition, significantly predicts students’ conceptual learning. Such investigations provide support for the importance of epistemological beliefs toward the learning process among the students.

2.3. Self-determination theory: Intrinsic motivation
Self-determination theory (SDT) was initially developed by Edward L. Deci and Richard M. Ryan and later it was elaborated and refined by many scholars. SDT is concerned with supporting intrinsic tendencies and innate psychological needs. Besides, it is concerned with the motivation behind choices people make excluding external influence and interference. It represents a broad framework for the study of human motivation and personality. SDT propositions also focus on how social and cultural factors facilitate or undermine people’s sense of volition and initiative, in addition to their well-being and the quality of their performance [1]. Conditions supporting the individual’s experience of autonomy, competence, and relatedness are argued to foster the most volitional and high quality forms
of motivation and engagement for activities, including enhanced performance, persistence, and creativity. Furthermore, motivational theorist have anticipated that learners are more likely to be intrinsically motivated more specifically when they developed sense of self-determination about their current scenario. For instance, learners are internally motivated and developed a sense of self-determination if they experience or engage into the activities in which learner seeks pleasure, find the task meaningful and prefer challenging tasks that maximizes continues leaning and development [8].

Intrinsic motivation is defined as the enjoyment of the learning process. It could be considered as an orientation of the learners toward mastery, curiosity, persistence, and the learning of challenging, difficult tasks, and conducting new tasks [40]. As indicated by self-determination theory, the concept of intrinsic motivation is the doing of learning task for its latent satisfaction instead of for some divisible consequences. According to [25], intrinsic motivation is the degree to which the students choose to accomplish a tasks because of their pleasure and enjoyment [41]. Based on the social-cognitive model, motivation is a dynamic and multifaceted phenomenon which explains to us why and how students are engaged in their learning processes. In line with this approach of thinking, research in motivation has determined a number of motivational constants that have implications on students’ learning activities [11].

3. Methods

3.1. Retrieval procedures
Attempts were made to retrieve all English-language peer reviewed journal articles published between January 2004 and January 2014 that empirically examined predictors of intrinsic motivation. The researcher chose this time period because a preliminary search showed research published in this period captured the majority of, and latest developments in literature published. The researcher searched nine electronic databases: Education, ERIC, Health Sciences, PsycINFO, Social Services Abstracts, Sociological Abstracts, and Sociology. Search terms used were motivation, extrinsic motivation, Goal orientation, Epistemological beliefs, and intrinsic motivation. To gain additional studies and insight information reference lists of included articles has been searched.

3.2. Significance of potential attributes in learning

3.2.1. Role of goal-orientation in learning. Goal orientation stresses the reasons for which a person engages in an activity for his or her own sake [21]. Accordingly, students hold personal goals which serve as reasons or factors for participating in or avoiding engagement in the activity [4, 42]. According to [22], students who are centered on showing their abilities to others and define their efficiency in relation to others are thought to be holding a performance goal orientation, while those who want to abstain from looking as incomplete are thought to be holding a performance-avoidance goal orientation. On the contrary, students with a learning goal orientation approach are centered on learning and improvement and identify their competence with respect to their previous performance.

3.2.2. Role of epistemological beliefs in learning. There is growing recognition of the importance of learners’ epistemological beliefs [28]. Epistemological beliefs, which are personal attributes, are the beliefs that individuals have in connection to the nature of knowledge and to the acquisition of this knowledge. Epistemological beliefs comprises of serval constructs including the perceptions of students about the knowledge, the procedural involves while acquiring knowledge, how to evaluate knowledge, and it also takes into the consideration of geographical aspects; where knowledge is obtained. Consequently, epistemological beliefs form a system of beliefs containing five dimensions namely the source of knowledge, structure of knowledge, stability of knowledge, progress and speed of learning, and monitor of learning. These dimensions are inter-related; independent functions of each other.
3.2.3. Role of intrinsic motivation in learning. The study of intrinsic motivation has essential vital effects. Intrinsic motivation has demonstrated to be an essential factor in enhancing and improving learning, creativity and challenges among students [8], it makes sense for schools and all educational settings and even workplaces to develop and increase the levels of intrinsic motivation among their students and teachers, as well as employees and instructors [11]. In addition, intrinsically motivated learners got higher scores and they are better balanced in their own learning surroundings than their extrinsically motivated counterparts. The students are potentially lifelong learners, and continue learning long after abandoning their formal instructive settings, because they do not need external motivators which are based on external rewards such as gifts, grades or prizes to engage in learning activities [14, 28] pointed out that the connection between learning behaviours and positive achievement outcome with intrinsically motivated students has incited numerous researchers to investigate different factors as indicators towards intrinsic motivation for learning.

In the area of social cognitive psychology, students’ goals are amongst the key indicators of their motivation and academic achievement [11]. According to [32] students engage in learning activities with various goals, which lead them to various reaction approaches in competence related to these activities. Therefore, the instructors have perceived the need to recognize the elements that contribute toward student’s accomplishment in the classroom [4, 42-43], and to get approaches and strategies to propel their students to succeed in academic learning. Additionally, students with more sophisticated belief profiles had higher levels of intrinsic motivation for learning and academic performance [32], which enhance the proposition that epistemological beliefs of the students have an effective role in their intrinsic motivation levels. There are only a few researches who have attempted to directly relate epistemological beliefs to students’ intrinsic motivation for the learning process.

To develop students’ intrinsic motivation, it may be necessary to provide them with a learning environment which includes a combination of contextual factors influencing their intrinsic motivation [33, 42] As [11] has argued in goal orientation theory, that goals assumed to be “representations of knowledge structures” which include a number of related beliefs and perceptions of students about purposes, competence, success, abilities, efforts, and standards of knowledge. Additionally, epistemological beliefs is described as a cognitive process that involves the approaches in which students think about the process of knowledge [11, 26]. Thus the epistemological beliefs and goal orientation have similar characteristics, such as beliefs and thinking of the students about the knowledge structures that affects a variety of approaches to gain that knowledge. As a result, epistemological beliefs and goal orientation are integrated and reinforce each other and may have more effective roles on intrinsic motivation [26].

4. Discussion and recommendations
This work attempts towards the consolidating and examination of the combination of goal orientation and epistemological beliefs along with the intrinsic motivation. Since there are separate studies that examined the relationship of goal orientation and epistemological beliefs with intrinsic motivation, this study extends previous studies by investigating the effects in combination of goal orientation and epistemological beliefs that may foster students’ intrinsic motivation. The primary focus of the study is on the role of two predictors i.e. goal orientations and epistemological beliefs on intrinsic motivation among university students.

The study is expected to benefit educators in helping them to understand the importance of goal orientation, epistemological beliefs and intrinsic motivation, as these factors relate to engaging their students in various academic tasks. The study will support parents in allowing them to realize the influence of the goal orientation and epistemological beliefs of their children as contextual elements in the formulation of intrinsic motivation. Finally, the study will help students to develop their potential as they discover the role of their intrinsic motivation, goal orientation and epistemological beliefs in adapting to diverse situations of learning during their university period.
5. Conclusion
The study aims to explore the literature that may facilitate educators, faculty members and policy makers in understanding their students' epistemological beliefs and goal-orientation towards intrinsic motivation. The consolidated literature provides insight into the apparent contradiction between the views of instructors in engineering educational settings that their students may be more naive about the construction of knowledge and recent studies, which point out that adult learners tend to have more sophisticated beliefs about the nature of knowledge and learning processes. In a nutshell, a comprehensive and solid theoretical foundation provide facilitation that may help educators in organizing content, preparing curriculums, and evaluate student tasks, so that students can begin to develop more mature and effective epistemological beliefs and design their proper goals for their learning process. Understanding the way their students think about knowledge and learning can help members of faculties in determining how to deal with their students. In order to produce engineers with high technical skills this study give high emphasis on intrinsic motivation in their teaching and learning practices as with the present study knowledge they will be able to develop effective teaching approaches for engineering students’ increased motivation towards technical skills.

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