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IDENTIFYING FACTORS INFLUENCING STUDENTS' MOTIVATION IN UX OF AN ONLINE INDUSTRIAL DESIGN EDUCATION

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ABSTRACT

Students are exposed to "niche" parts of industrial design that demonstrate accuracy and amount of detail in order to meet real-world design standards. According to the research, keeping students' enthusiasm while enticing them to enroll in an online industrial design course is tough. Currently, technological advances in e-learning are used to make industrial design education and learning more engaging for students. In reaction to new advances, the learners' e-learning methods and motives are evolving fast. According to research, the technological advancements in e-learning are primarily appealing because they are novel and distinct. When learners get used to them, they may lose interest and become less motivated. Motivational aspects of an e-learning platform can aid in comprehending learners' motivation and knowledge acquisition strategies. However, there is a paucity of literature describing methods for evaluating the motivation of online industrial design learning. In the context of online industrial design education, the complexity of students' motivation, drives, and motivational theories has further complicated the evaluation process. This research investigates the relationship between the efficacy of an online industrial design learning platform and the motivation of students. The research used a mixed-methods approach and surveyed and conducted semi-structured interviews with 200 participants who received an online education in industrial design. The research analyses different aspects of industrial design education and their relationship with the attitudes and motivations of students, which may enhance their performance in industrial design applications.

KEYWORDS

Industrial Design, Design Education, Motivation and e-Learning

1. INTRODUCTION

In this era of online teaching many issues about online teaching's efficacy and effects on instructors and students have arisen (Vikas & Mathur, 2022). Understanding student perspectives may assist educators make more learner oriented online modules. In a fast

technological development, and knowledge-based economy, educators desire to educate learners with sophisticated technical skills and core competencies. Preparing learners for a fast-changing workplace requires an effective e-learning framework. Technology is routinely utilized to improve student engagement and educational accomplishments (Carle et al., 2009) (Carle et al., 2009). One such required field is industrial design competencies where prototypes are traditionally used to visualize and test designs. The lack of a clear separation between theoretical knowledge and practical abilities is also a feature of design as an educational discipline. Because industrial design is a technology-driven field, it needs a unique evaluation for learning motivation. Motivation to learn reveals that a student wants to learn through training (Garavan et al., 2010). Motivation is the degree of goal-directed effort (Garavan et al., 2010) and learning motivation is a student's endeavor to learn. Motivation may be inherent or external, depending on situational and environmental influences (Ryan & Deci, 2006).

In order to assess the factors influencing the motivation of learners in an online industrial design, an integrated computer aided design (CAD) and 3D-printing course was identified (Zardari et al., 2021). Research suggests that learners prioritize e-learning quality (Fayed & Cummings, 2022). Many non-motivated adult learners leave e-learning in their early stages. This is due to the poor design and usability of e-learning platforms to a large part (Granić & Ćukušić, 2011). Basic skill training in computer-aided design and 3D printing technology was provided through the selected course programme, which was led by professionals with relevant industry experience. The technique of this research project combines end-user evaluations for motivational analysis with expert inspections. As a consequence, the study received a significant amount of feedback from students, teachers, and experts. The objective of the programme was to broaden the participants' skill sets as well as locate a feasible commercial opportunity in the realm of industrial designing and 3D printing. The training was conducted entirely online and was made available to all enrolled applicants. The student journey flow is shown below:

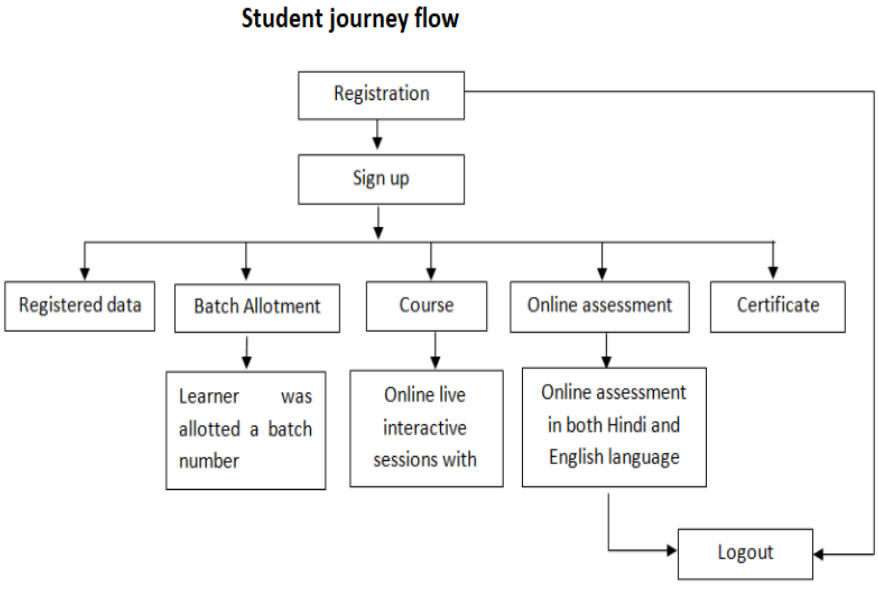

Figure 1. Student journey flow

This student flow breaks down the activities into tasks for the students, which generally results in a list of all the things an online learner may encounter chronologically in the simplest method.

The importance of e-learning interfaces that are more precisely matched to how people naturally learn, live, and gain information cannot be overstated. These interfaces also influence the motivation of the learners (Matsuo et al., 2008) (Barolli et al., 2006). If the interface is not clear and simple to use, learners' focus will be on interaction rather than content acquisition. Correspondingly, User experience (UX) has been defined as a result of the user's internal state (predispositions, expectations, needs, motivation, humor, etc.), the designed system's characteristics (e.g., complexity, purpose, usability, functionality, etc.), and the context (or environment) in which the interaction takes place (e.g., online, organizational environment, the importance of the activity, voluntary use, etc.) (Hassenzahl & Tractinsky, 2006). As the user experience (UX) and the user's motivation are subject to so many different factors, assessing them may be challenging. Particularly important in the development of any online industrial design course is the need of providing a high-quality experience for the students who will be taking the classes. A user develops a subjective physical and emotional feeling whenever he or she interacts with an e-learning platform. This sensation has an effect on the user's motivation. The emotional domain of e-learning is concerned with how the internal outlook of learners may be increased by the use of instructional content, which in turn motivates learners to learn. As standard methods of assessment are inadequate for UX evaluation, a strategic assessment technique is necessary in order to improve the user experience (UX) and user motivation of an e-learning platform. (Laugwitz et al., 2008). Industrial designers almost exclusively work with sketches, clay, and other traditional media, which gives them a unique perspective on digital prototype. Digital prototypes are critical to production processes. Transitioning between physical and digital representations of a prototype during design iterations is thus a major barrier in the industrial design process.

2. LITERATURE SURVEY

2.1 Types of Motivation in an Online Industrial Design Education

Educators of online industrial design learning argue that learners must have control over the interaction and be creative in their participation (Andrews, 1996). They recognise the learners' intuition and embody emotion and motivation. Educators may not have an abstract theory to explain these events, but they do have a clear commitment to accommodating a wide range of user perceptions that includes motivation. Intrinsically motivated activities corresponding to online industrial design learning are interfaces, digital interactions, multiple sensory-motor coordination, continuous learning, and confidence (Krippendorff *, 2004). These aspects of intrinsic motivation provide an explanation for the impetus for the adoption of industrial design education, which contradicts causal and logical explanations of human behavior. Learners have the freedom to decide how they would want to spend their time in the course. The purpose of the learners is not to reach a conclusion; rather, they are to participate in a process of deliberate engagement and find solutions to design issues that develop along the way.

2.2 Relationship of Motivation with Emotion and Cognition

Motivation is the driving force behind all human behavior, causing a cascade of changes both intellectually and emotionally. Motivational orientations influence and condition behavior, as well as the degree to which students assimilate knowledge during their instruction (Sánchez-Barroso et al., 2020). In industrial design learning, incorporating assessments and evaluation stimulates learners' and helps them achieve their learning objectives (Wilson & Choi, 2020). In e-learning contexts, learners' intrinsic motivation was found to be strong and motivation fosters self-determination and passion, which encourages students to put up greater effort in both personal and academic endeavors (Singh, 2011) (Fırat et al., 2018). E-learning, hands-on and project-based learning are all popular active teaching methods presently. These learning techniques provide a pleasant emotional response (Terrón-López et al., 2017) (Jeong et al., 2019).

2.3 Impact of Motivation on e-learning

Literature in educational psychology asserts that student motivation is a significant factor in e-learning (Jeong & González-Gómez, 2019) Both intrinsic and extrinsic motivations can be conceptualized and measured as influential indicators for students' satisfaction, enjoyment and excitement. It has been found that the main cause of the incompleteness of an e-learning program is poor student motivation. A high motivation level is necessary for students to be successful in e-learning (Cain, 2008) In other words, students who are motivated will perceive greater success and satisfaction than those who are not (Cain, 2008)

3. RESEARCH METHODS

3.1 Procedures

This study followed a mixed method research technique with a descriptive approach. This method is helpful for capturing user's motivation, convictions, and attitudes (O'Brien & Lebow, 2013). Additionally, mixed method approach is an emerging used research approach in the domain of UX (Krawczyk et al., 2019). Both Survey questionnaires as well as semi-structured interviews were conducted for the purpose of this study. The data has been collected in one phase which provided the scope of triangulation as well as additional insight (Reio, 2009). The population of the study are 'learners' who have gone through an online industrial design course. A convenience sampling method was used to select samples. The sampling group consisted of learners who completed an industrial design course named "Computer Aided Design (CAD) and 3D printing". The questionnaire consisted of five broad themes that were targeted to find out their motivation while undergoing the course. They are: 'Effectiveness of the course', 'Self-motivation', 'Career/academics-oriented goals', 'Motivation and social cohesion' and 'Opportunity based emotional motivation'. A combination of statistical analysis and qualitative analysis approaches were followed for the data analysis purpose.

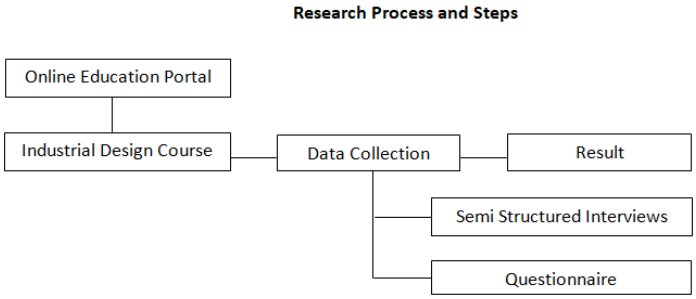

Figure 2. Research flow chart

3.2 Context and Participants

A total of 289 learners were contacted and were asked to respond to the survey questionnaire. Questionnaires were circulated multiple times to get maximum participation. A total of 200 responses for the survey questionnaire were received. 50 interviews were conducted to get in depth insight about motivation affecting learning of industrial design platforms.

3.3 Analysis and Results

The survey questionnaire developed for this study was also tested for reliability. Cronbach alpha were calculated for an internal consistency check. The result of each section is given below:

Table 1. Cronbach alpha for the questionnaire data

Themes for Questionnaire	Effectiveness of the course	Self-motivation	career/Academic oriented goals	Motivation and social cohesion	Opportunity based emotional motivation
Cronbach's Alpha	0.79	0.82	0.81	0.92	0.82
Interpretation of score	Good	Good	Good	Excellent	Good

Questions under each of the themes have either near to 0.8 or more than o.8 score which is considered good. The acceptable score of Cronbach's alpha to be reliable is 0.7.

3.4 Demographic Analysis

Cross-sectional research was conducted to understand learners' background on the imposition of online learning of industrial design. The Total strength of students who underwent industrial design is approximately 200. The needed sample size was determined as 200, with a margin of

error of 5%, a confidence interval of 95% and a response distribution of 25%. A self-designed qualitative questionnaire was used as a research tool. The questionnaire's components were selected based on the learners' academic background and accessible literature (Abbasi et al., 2020). Using the field pretest approach, a 7-item online questionnaire with three domains was planned and produced. Internal consistency (Cronbach's alpha) was computed using the data from the pilot research. Cronbach's alpha coefficient was calculated to be 0.83. Using a Likert scale, several features of learners' perspective that affect their learning were considered for the study based on evidence from numerous factors. The impact of demographic factors on several areas of students' learning are shown below.

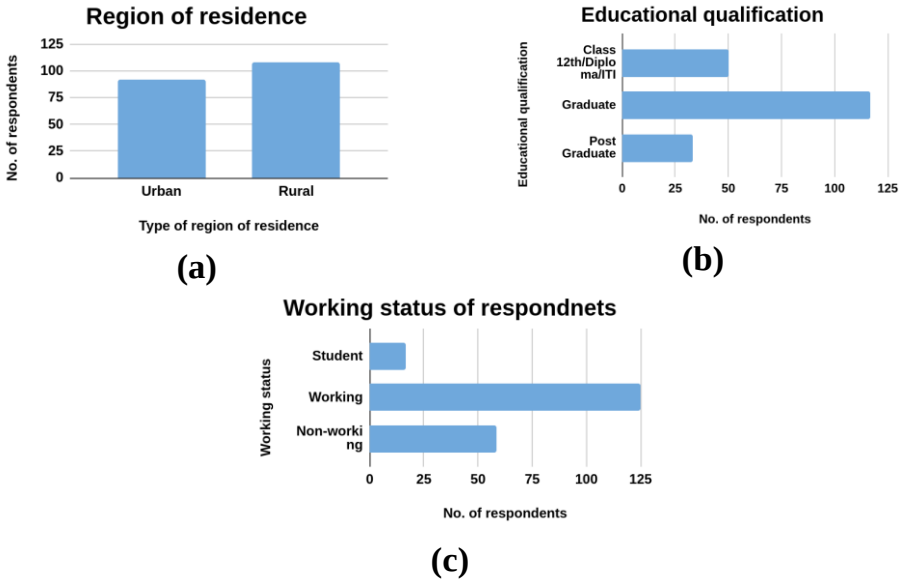

Figure 2 (a) (b) (c). Demographic data of the learners'

Through an online survey of 200 learners, we want to get a better understanding of students' perceptions and preferences for online industrial design learning. We also looked at the preferences of students for different aspects of online courses, which may help in creating a more successful online learning environment for industrial design courses. The responses for the perception about online courses are shown below.

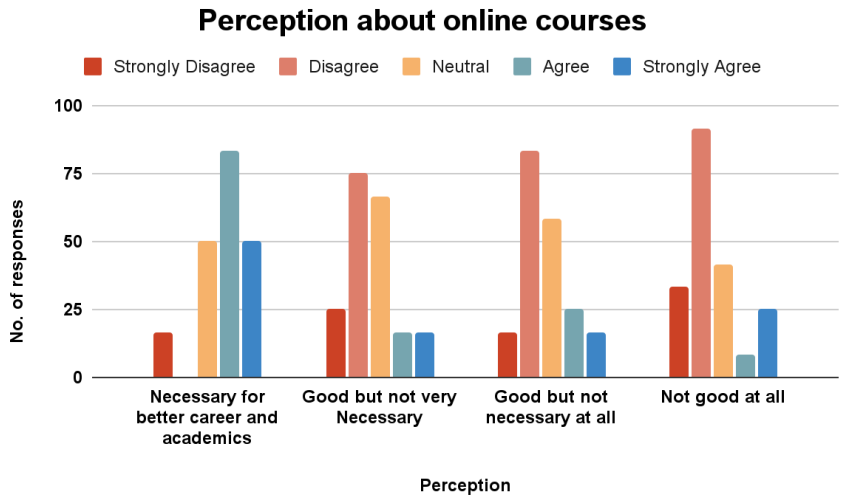

Figure 3. Perception of the learners

3.5 Interview Findings

Following the trial, participants rated their degree of motivation with the two indistinct factors of an online industrial design course namely 'course content' and 'course prospectus'. The likes and dislikes of the course, as well as how it affects learners' motivation, are included in these reports. The factors of course content affecting motivation were 'course module', 'online assessment', 'downloadable notes', 'tool installation', 'live classes' and 'availability of recorded lectures. Similarly, the factors of course prospectus affecting motivation were 'peer discussion', 'lower fees', 'course structure', 'hands-on exercises', 'instructor quality', 'referrals' and 'certifications'. The frequency with which participants encountered these motivational factors related to the course, however, were varied. Figure 4 depicts the motivational features that were experienced, mentioned and discussed by the learners.

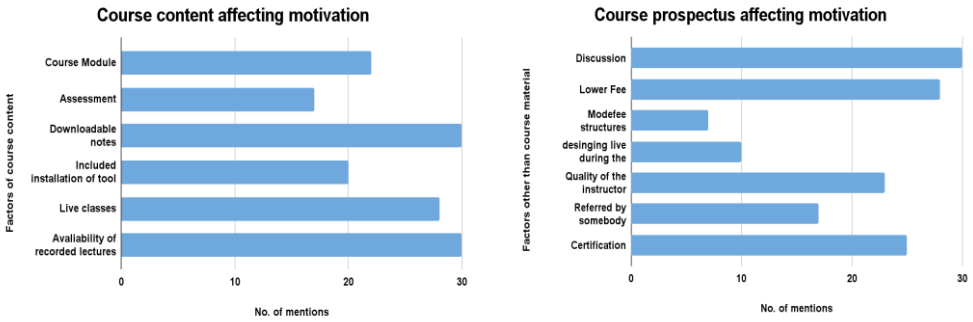

Figure 4. Motivational factors of the course as suggested by the learners'

3.6 Questionnaire Findings

3.6.1 Effectiveness of the Course

Few of the benefits of online industrial design courses are the effectiveness in educating students and its use as a professional development, in combating the rising need of technical skills and core competencies. Figure 5 below shows how effective factors of an online industrial design course influences motivation of the learners. The factors for the effectiveness of this course are ‘level of difficulty’, ‘comprehensibility’, ‘usefulness’, ‘extent of effort’ and 'need for help’. Survey questions for the effectiveness of the course was; Whether this course was difficult for you to understand/comprehend? Were you sure about the usefulness of this course? etc.

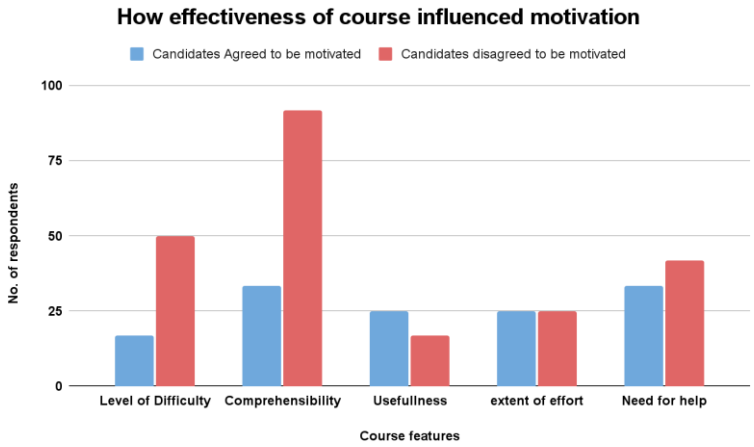

Figure 5. Effectiveness of course and motivation

3.6.2 Self-Motivation

Motivation has been highlighted as a crucial component impacting learning in the realm of education (Lim, 2004). Learner motivation has been linked to a number of significant learning outcomes, including perseverance, retention, success, and course satisfaction, according to previous research (Vallerand & Blssonnette, 1992) (Lepper & Cordova, 1992). In a survey on self-motivation, the topics asked were: "Do you prefer to learn new difficult things?" Do you feel a connection between the information presented and the hands-on activity? The following table illustrates how variables of learning attitudes that may be connected to motivation, such as "learning ardor," "curiosity," "acquiring new information," and "applying new knowledge," can all be related to motivation.

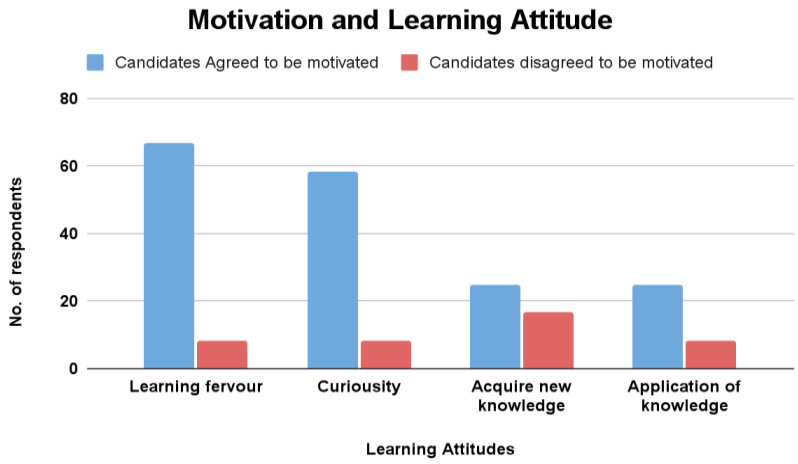

Figure 6. Learning attitudes and motivation

3.6.3 Career/Academics-Oriented Goals

Through the fulfillment of the three fundamental needs, learners develop a more developed sense of self and improve their psychological well-being through academic achievements. Motivational factors related to career are 'satisfaction', 'job-ready', 'technology', 'exhibition of learning' and 'Online learning excitement'. The questions that were asked in the survey about career related aspirations include things like "Do you feel pleased and content with the marks you received in this course?" Do you like demonstrating your worth to those closest to you, whether it be your family and friends, your work, or other people?

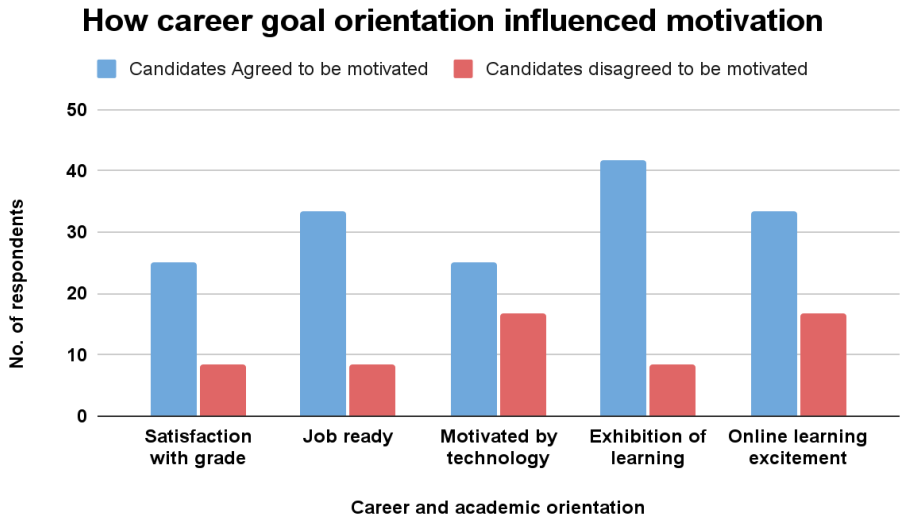

Figure 7. Career and motivation

3.6.4 Motivation through Social Cohesion

Students may benefit, among other things, from engaging in collaborative learning because it may help them build higher-level cognitive capacities, verbal communication skills, and self-management abilities. The factors relating to social cohesion and motivation are ‘frequent discussions’, ‘connection with instructor’, ‘team work’, ‘networking with instructor’, ‘peer networking’ and ‘peer review’. The following are examples of survey questions about how social cohesiveness promotes motivation: Do you like connecting with other learners and having meaningful conversations with them? Do you prefer to work on solitary projects or in groups when given the choice?

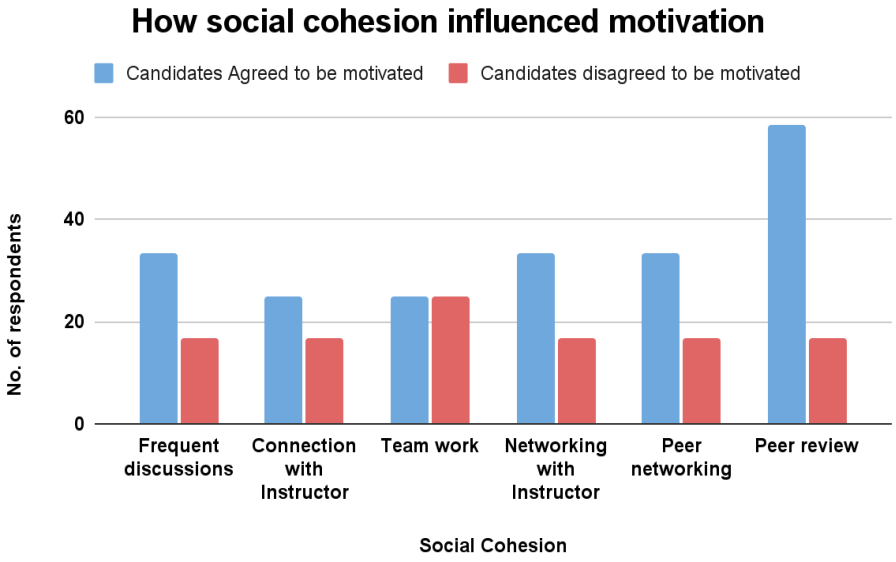

Figure 8. Social cohesion and motivation

3.6.5 Opportunity based Emotional Motivation

The structure of student participation is multi-dimensional. It is considered that learning occurs when students apply their emotional and cognitive resources; hence, emotional and cognitive engagement is crucial in learning. Emotions are made up of phenomenology, physiological, expressive, behavioral, and motivational components (Özgür & Altun, 2021). The employment of electronic technology has led to the expansion of educational options and facilitates the skill development of students. E-learning may have a profoundly good effect on learners' engagement, instructors' positive attitudes, individualized learning, and students' inventiveness. The research has explored online learning through the lens of students' views and experiences, the instructional approach utilized to attain results, and the socio-cultural phenomena that enable socially constructed learning and meaning. In addition to the virtues of phenomenological and ethnographic research on student learning in online environments, controlled research evaluating performance outcomes across delivery modalities (i.e., face-to-face and online) is also essential.

The opportunistic and emotional factors that influenced motivations for an online industrial design course are 'effort worthy', 'time worthy', 'emotionally exhaustive', 'rewarding', 'thought provoking' and 'persuasive'. The following questions were asked in the survey to assess participants' levels of emotional motivation: Do you believe that the result (in terms of learning) you obtained was worth the effort? Do you believe that the time spent on this class might have been employed more productively in another setting?

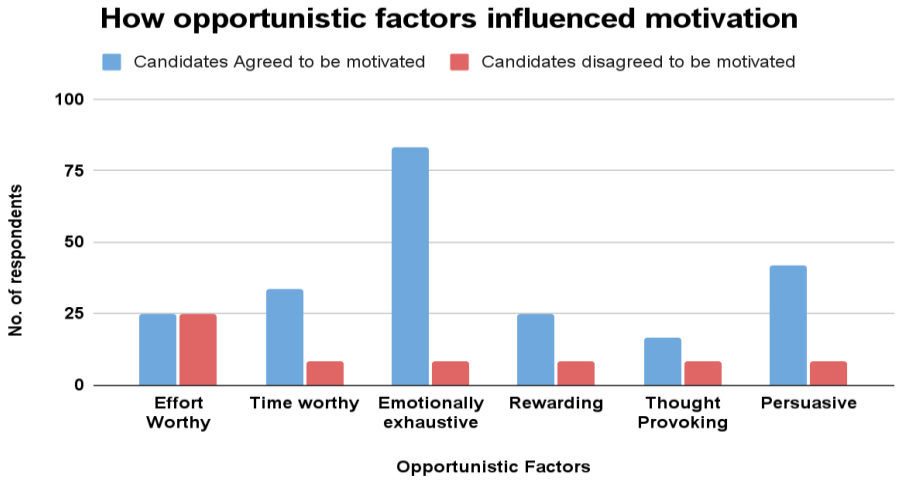

Figure 8. Opportunity based emotion and motivation

4. DISCUSSION AND CONCLUSION

According to the findings that were derived from the analysis of the data that was collected in this study, there is a basic connection between the e-learning course and the motivational moods of the students. According to the data, the vast majority of students feel that they were sufficiently motivated while participating in the online industrial design course. These levels of motivation have an effect on the learner's capacity for learning and the consequences of that learning. Even though the study's objective is constrained by the low size of the sample, the results obtained from the experiment offer useful insight into the possible role that motivational arousal plays in the learning process. As a consequence of this experiment, it has become abundantly evident that behavioral datasets, such as interview and questionnaire data, would be able to assist in understanding what kind of e-learning design the learners need in terms of their motivations. Even though methods for identifying motivational states have made significant strides in recent years, additional research is still required to discover effective industrial design e-learning features for eliciting motivations that are substantially influenced by cognitive characteristics such as expectations and perceptions. Even if the most basic motives are shared by all people, the aspects of an online industrial design course that evoke powerful incentives may be investigated. As a direct result of this, approaches should be created in which every learner of industrial design actively and deliberately participates in the choosing of what motivates them.

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