WIP: Exploring the Effects of a Purpose-in-Life Reflection Activity in an Introductory Artificial Intelligence Course

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Abstract – Sense of purpose in life is related to actively choosing to work for the benefit of society and has been recognized as a key influencer of well-being, which in turn has been established to be correlated with students' self-regulation. Activities for developing students' sense of purpose may become relevant, especially in the context of recent advances in Artificial Intelligence (AI), which, some argue, may lead to a decreased sense of purpose. In this work-in-progress paper we describe ongoing research whose objective is to (1) understand how to develop a greater sense of purpose in students, exploring its relation to self-regulation and to (2) understand the relation between students' sense of purpose and their academic and personal motivations. Specifically we describe a multiple methods study that we carried out on an introductory AI course at a highly selective engineering school in Latin America in which 144 students participated. We designed a Purpose-in-life Reflection Activity (PRA), whose answers we analyze qualitatively using a hybrid approach of inductive and deductive coding to see the relationships between academic and personal motivations. Students completed the *Purpose in Life* (PIL) and *Self-Regulation of Learning* (SRQ-L) questionnaires three times during the semester: at the start of the course, after the completion of the PRA, and at the end of the course. We found a positive and significant correlation between PIL and the Autonomous regulation subscale of the SQR-L questionnaire. We found no statistically significant differences in PIL scores during the semester. Our preliminary findings show that students were able to articulate connections between their personal and academic motivations with broader societal challenges, as well as reflect upon the potential impact of AI technologies. We show that one activity like the PRA we designed may not be sufficient to have an effect on students' sense of purpose. Therefore, more research is required to understand what types of activities can be introduced in an engineering curriculum to effectively develop students' sense of purpose.

Introduction

Engineering is a discipline mainly concerned with the betterment of society. To get engineering students to gain awareness about their potential contribution to society, educators may encourage them to reflect on which societal issues are aligned with their skills, talents, and desires. Development of such an awareness may result in enhanced motivation to contribute to society.

A concept from the area of psychology which is very related to working for the benefit of others is *purpose in life*. According to Frankl's existential philosophy, the attainment of purpose in life occurs when one embraces a cause beyond oneself and takes responsibility for aligning one's actions with that cause. This philosophy proposes to give meaning to life through work for others [1]. As such, the development of purpose in life is related to detecting issues beyond personal matters, for which one feels a deep calling to commit action [2].

Developing a higher sense of purpose in life in students may lead them to steer their career towards societal benefit, but it may have additional learning benefits. Sense of purpose is central to personal well-being and is closely linked to resilience, motivation, decision-making, and adaptability to challenges [3][4]. Despite its importance, engineering curricula rarely incorporate activities to foster students' sense of purpose in life. This omission seems particularly concerning in the context of emerging Artificial Intelligence (AI)

technologies, which, as recent philosophical inquiries suggest, could potentially diminish the population's sense of purpose in life [5].

This work-in-progress paper describes progress towards answering the research question: *How do interventions aimed at fostering a greater sense of purpose among engineering students impact their motivation, engagement, and self-regulation?*. Specifically, in this paper we propose a purpose-in-life reflection activity (PRA) tailored to an Introduction to AI course at Pontifical Catholic University of Chile . We chose an Intro to AI course precisely because of the recent arguments described above regarding a possible diminish of purpose in life caused by wide adoption AI technologies. We followed a multiple methods approach to understand the effects of the PRA over purpose in life and self-regulation, which we assessed using *Purpose in Life* (PIL) and *Self-Regulation of Learning* (SRQ-L) questionnaires three times during the semester: at the start of the course, after the completion of the PRA, and at the end of the course. Responses from the PRAs were qualitatively analyzed using a hybrid approach to qualitative coding, combining deductive and inductive methods, this approach allows for the identification and integration of new themes that emerge directly from the data, beyond the initial theoretical frameworks [6]. A codebook based on Self-Determination Theory (SDT) [7] and the Dynamic System Model of Role Identity (DSMRI) [8] was developed to understand the relationship, if any, between AI education and students' personal and professional development (deductive approach) [9]. Inductive coding was also used, which allows themes to emerge directly from the data [9].

This paper outlines our methodological approach and presents preliminary findings, offering insights into how integrating discussions about life purpose within AI education can enrich the learning experience. It contributes to the broader discourse on the need for a holistic educational approach in engineering that nurtures not only technical prowess but also personal growth and fulfillment.

The literature review and theoretical framework developed for this research addresses the important role that AI could play in education, emphasizing its influence beyond technical skills to affect the psychological and affective dimensions of students, especially in engineering. It highlights the importance of a "sense of purpose in life" for personal development and well-being, pointing to a gap in the incorporation of purpose-building activities in engineering education. The theoretical framework proposes an integration of SDT and DSMRI in AI education in order to provide a holistic view of the impact of AI on students' motivation, sense of purpose, personal growth, and role identity, suggesting that AI education could shape both technical competence and personal development within the evolving field of AI.

Methodology

Study Context and Participants

This study was conducted in the context of an *Introduction to Artificial Intelligence* course at the School of Engineering of the Pontifical Catholic University of Chile during the second semester of 2023. The course enrolled a diverse group, primarily from various engineering disciplines. The sample used in this research was the students of the AI course of the second semester 2023. The total number of students was 143, with 83% men (118) and 17% women (25). This course has students from different academic levels, between second and last year of the engineering career, and from different majors including students from data science, physics, college and 6 exchange students; however, most of the students are from engineering, being 79% of the total.

Instruments

Purpose-in-Life Reflection Activity (PRA)

Designed specifically for this research, the PRA was given as an initial assignment called "Reflecting on Humanity and AI". It was designed to encourage students to reflect on their skills and how they can be applied to global problems. The first part of PRA was focused on personal skills and global challenges. The main objective was to identify an issue in the world that they would like to actively work on in their lifetime, where they could use their skills. For this, they were first asked to identify personal skills and talents, listing at least two skills or talents in which they excel above the average population and explaining why they believe they are above average. Students were then introduced to the concept of "flow state" with a video, and then asked to describe two or three activities they do regularly that induce a state of Flow. Once these steps were completed, the students listed three global problems to which they could contribute, using the competencies they had identified. They then choose one problem and explain it in detail, justifying how they would use their skills to address it and discussing whether working on this problem could induce them to Flow. The design of this activity was based on the relationships between identification of skills (e.g., [10]) and flow state (e.g, [11]) in the development of a sense of purpose in life.

Finally there was an interaction with ChatGPT, where students had to use it to brainstorm how they could apply their skills to each of the three global challenges listed. They included screenshots of these interactions in their presentation, and critically analyzed the answers given by ChatGPT, expressing their agreement or disagreement and suggesting improvements based on their criteria, preferences and common sense.

Purpose in Life - Short Form (PIL - SF) Questionnaire

This questionnaire is a tool for the evaluation of life purpose, which measures the life purpose perceived by individuals. It provides a quantitative measure of the sense of purpose at different stages of life [12]. For this research, a variation of the instrument was used to assess more specific aspects, evaluating the following aspects: Presence of clear life goals, Life being meaningful, Life goal completion and Presence of goals/life purpose [13]. This variation of the instrument was used because of its focus on aspects of particular relevance to the academic environment. The Purpose in Life Test - Short Form PIL-SF, was proposed by Schulenberg et al. [13] retaining items 3, 4, 8 and 20 of the original scale. This is a self-administered questionnaire, where respondents must select a score on a likert scale from 1 to 7 for each of the items. Higher scores indicate a greater perception of current purpose in life. PIL-SF has been adapted to Spanish and has demonstrated greater internal consistency and greater accuracy in assessing directed purpose in life, specifically [14].

Self-Regulation of Learning Questionnaire (SRQ-L)

The Learning Self-Regulation Questionnaire (SRQ-L) is an instrument based on the Self-Determination Theory (SDT) and is designed to assess individual differences in motivation or regulation styles. Introduced by Ryan and Connell in 1989 [15], it focuses on why individuals engage in specific behaviors, offering options that represent different regulation or motivation styles - either autonomous or controlled.

For this research, the SRQ-L was specifically adapted to the context of an AI course and translated into Spanish. The questionnaire is structured to understand the reasons behind students' learning behaviors in this particular setting. It consists of 12 items divided into three

sections, forming two subscales: *Controlled regulation* and *Autonomous regulation*. The questionnaire provides a nuanced tool to evaluate how students regulate their learning in the AI course, potentially influenced by intrinsic or extrinsic factors.

Data Collection

The AI course was chosen due to its relevance and large enrollment, offering a representative sample for the study. The research team presented the informed consent and project details to the students. A Google form was used to collect digital consent, to which 90% of the students responded and 97% of those who responded agreed to participate. After obtaining consent and completing questionnaires, students received a code to access the PRA. This assignment was to be completed individually over two weeks, outside of class hours, and submitted in PDF format through the course platform.

Data Analysis

The quantitative component of our study involved statistical analysis of responses from the PIL and the two subscales of the SRQ-L questionnaires, administered at three key points during the semester: at the outset, following the PRA, and at the conclusion of the course. We conducted correlation analyses to examine the relationships between students' sense of purpose and their self-regulation. Furthermore, an Analysis of Variance (ANOVA) was performed to identify any statistically significant differences in PIL scores across the three measurement points, offering insights into the temporal dynamics of purpose in life in relation to the educational intervention.

For the qualitative analysis we integrated deductive and inductive coding to thoroughly examine the textual data obtained from the PRAs. This approach was instrumental in understanding the complex interplay between AI education and students' personal and professional development. Initially, a codebook was developed based on key concepts from SDT (as, Relatedness, Autonomy, and Competence) and the DSMRI (as, Emotion, Perceived action possibilities, and Purpose and goals), along with AI-related themes identified in the literature review.

Recognizing the potential for emergent themes not captured by our initial codebook, we remained open to the data, allowing new codes to arise directly from students' reflections. This iterative process enables us to refine our codes and capture deeper insights into how students perceive the role of AI in their lives and society. Some of the codes that have emerged in these iterations are: ChatGPT Perceptions, AI Concerns, AI Challenges, AI Impact and AI Applications.

MaxQDA software was used for efficient organization of the data and to identify patterns, discrepancies, and key themes in the students' reflections. This qualitative analysis complemented the quantitative data, providing a more comprehensive view of the PRA's impact.

Preliminary results and discussion

The preliminary findings from this research offer several methodological and educational insights. First, they underscore the feasibility of conducting multiple methods research in engineering education to explore complex constructs like sense of purpose and self-regulation.

After a first quantitative analysis of the questionnaire results, we observed a positive correlation between students' sense of purpose, as measured by the PIL questionnaire, and their self-regulation of learning, as measured by the *Autonomous regulation* subscale of the SRQ-L Questionnaire. The Pearson regression between both variables is 0.35. The coefficient of determination (R Square) is 0.13, which means that about 13% of the variability in PIL is explained by the Autonomous regulation variable in this model. This correlation suggests that students with a higher sense of purpose also show a higher degree of autonomous motivation toward their learning, a key component of self-regulated learning. On the other hand, no significant relationship was found with controlled regulation as measured by this same questionnaire. The Pearson regression between the *Controlled regulation* subscale of SRQ-L and PIL is 0.07, indicating a weak correlation between these variables.

These results were corroborated in the three instances of the semester in which the questionnaires were administered, and this positive correlation between PIL and the autonomous regulation SRQ-L subscale suggests that interventions aimed at enhancing students' sense of purpose could have beneficial effects on their learning behaviors, particularly their intrinsic motivation and engagement with their studies.

The ANOVA test of the PIL scores obtained the three different instances of the semester (with a mean of 21.49, 21.40 and 22.02 respectively), resulted in an F-statistic of approximately 1.88 and a *p*-value of approximately 0.155, thus there is no statistically significant difference between the means of the three groups based on the provided data and our simulation. These initial results indicate the complexity of influencing students' sense of purpose within the timeframe of a single semester, suggesting that the development of purpose may require a longer or varied set of interventions.

Despite this, qualitative analysis of the PRAs revealed that students were able to articulate connections between their personal and academic motivations with broader societal challenges, as well as reflect an understanding of the potential impact of AI technologies. These observations underline the importance of integrating reflective practices into the engineering curriculum. Encouraging students to consider the societal implications of their technical skills can foster a deeper engagement with their field of study, potentially leading to more motivated and purpose-driven career choices. However, the lack of significant change in PIL scores also indicates the need for a more sustained or multifaceted approach to cultivating a sense of purpose among engineering students.

The engagement with ChatGPT as part of the PRA also provided valuable insights. Students' critical reflection on the AI-generated responses allowed them to engage more deeply with the ethical and practical dimensions of AI technologies. This interaction highlights the potential of AI as a tool for stimulating critical thinking and ethical reasoning in engineering education.

Conclusion, limitations and future work

The integration of PRA into an introductory AI course has provided initial evidence of the positive relationship between students' sense of purpose in life and their self-regulation in learning. Our qualitative analysis shows students could establish connections between their motivations with broader societal challenges; however, our preliminary results also indicate that a single activity may not be sufficient to produce significant changes in students' sense of purpose in a short period. This underscores the need for further research to identify and develop effective strategies for integrating purposeful reflection and ethical consideration into the engineering curriculum.

This study has a number of limitations. First, we use the self-reported PIL and SRQ-L questionnaires, which may introduce biases in the way we measure students' sense of purpose and self-regulation. Second, biases could also be introduced by the composition of our sample of students, predominantly from engineering, which in addition has a substantial gender imbalance, limiting the generalizability of the results to other disciplines and populations. Third, the short duration of the intervention and of the study itself may not have been sufficient to capture the full extent of changes in students' sense of purpose. Longitudinal studies may be needed to understand the long-term effects of purpose-in-life activities in the educational context. Finally, reliance on a single type of intervention, our PRA, may not fully represent the spectrum of activities that could influence students' sense of purpose and motivation, highlighting the need for further research on diverse and multifaceted interventions within engineering education.

The next stage of the research includes a comprehensive qualitative analysis of the data obtained in the PRAs, for further triangulation of the quantitative data with the qualitative data. Ultimately, we hope that this research can contribute to the formation of well-rounded engineers, not only technically competent, but also deeply committed to the ethical and social dimensions of their work.

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