Personalized Learning Coach:

An adaptive application for mindset and motivation

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***Abstract*—This paper outlines an idea for an adaptive application which would integrate with other digital learning platforms to generate a profile for a learner on their mindset, goals, and motivation. This adaptive system would then provide personalized coaching through prompts based on the learner's profile and engagement within the learning platform, in order to shift mindsets and increasing learning outcomes.**

Keywords—learning; motivation; mindset; goals; outcomes; adaptive; prompts.

I. INTRODUCTION

Digital technology is revolutionizing every industry, creating pathways to new efficiencies and more effective use of resources. The education industry is changing as well with personalized learning, blended classrooms, virtual reality, and a variety of other technology advances [1]. There are decades of research on how and why we learn, but the internet as a learning tool allows for data to be gathered, analyzed, and acted upon. What if the body of research on learning mindset and motivation could be utilized as a personal adaptive learning coach for any online learning tool? A Personalized Learning Coach (PLC) could integrate with online learning system such as language learning apps, children's coding apps, massive open online courses (MOOCs), professional training, and more. The PLC would gather information on a learner's goals and mindset and then adaptively deliver advice, reinforcement, and encouragement based on the learner's unique profile and actual engagement with the learning content, all with an aim to improve the learner's outcomes.

This proposed application is an idea resulting from my learning and motivation research as a doctorate student, and experience working in educational technology. While the technical implementation is beyond the scope of this paper, I will outline the motivation and learning theory which would drive the functionality of the application (Section II), the proposed adaptive behavior of the application (Section III), and the outcomes and significance (Section IV).

II. LEARNING AND MOTIVATION THEORY

Motivation is a complex and multifaceted concept with significant research looking at types and approaches within an educational setting [2]. While there are many approaches to motivation, the PLC would target shifting mindsets and beliefs to better support motivation to learn, as learners with this type of motivation continue to engage in activities even if not immediately interested do so because they find the program valuable and desirable [8]. "Motivation to learn refers to a student's propensity to value learning activities: to find them meaningful and worthwhile, and to try to get the intended benefits from them. In contrast to intrinsic motivation, which is primarily an affective response to an activity, motivation to learn is primarily a cognitive response involving attempts to make sense of the activity, understand the knowledge that it develops, and master the skills that it promotes" [2]. The PLC would utilize many strategies to help students increase or maintain motivation to learn.

A critical theory behind the PLC is understanding the mindset and beliefs of the user. Learners who believe they can learn new things (incremental theory) often display better learning outcomes and self-esteem than those who believe their abilities to learn limited (entity theory) [3][4]. Intervention studies have shown that shifts can occur from entity to incremental thinking through stimulation [5]. One main strategy of the learning coach would be to attempt to replicate these findings that mindsets can be shifted from incremental to entity.

Understanding a learner's goals can illuminate why they are engaged with a particular learning activity and how to best support them. There are two distinct types of goals which are useful for this project: purpose goals which explain why something is being learned, and target goals which express how something will be learned [6]. Explicit goal setting can be especially helpful for learners struggling with motivation or self-efficacy. Guiding students through the process of setting goals and reflecting on their own learning can lead them to engage in activities with motivation to learn. With a model for setting goals and significant reinforcement, learners have shown development and growth of motivation to learn [7].

III. AN ADAPTIVE APPROACH

Computer tutoring systems focused on content are nearly as effective as human tutoring [9], so an adaptive program aimed at addressing non-domain specific content could be equally as effective. This PLC could integrate with any digital learning application for which a user creates an account, and could track a user from one learning tool to the next. A critical component of integration with other learning platforms would be the ability to receive and analyze data as learners answer practice questions and engage with the content in the native platform.

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The purpose of the Personalized Learning Coach is to shift mindsets and improve learning outcomes by gathering information about the learner and adaptively delivering prompts and content based on the learner's profile and subsequent learning actions. The first step, then, is to create the learner's profile. The learning coach would begin by delivering a battery of validated surveys on growth mindset, self-efficacy, goals, and motivation. The learner would be asked to enter their purpose goal for why they want to learn the material, and decide on target goals for the content. Based on the learner's answers, the coach would provide an analysis of the learner's mindset and beliefs, and suggestions for learning strategies. This profile and the resulting suggestions (derived from learning theory) is the first personalized set of content delivered to the learner.

With the learner's profile established, the PLC would then engage with the learner periodically through notification pop-ups, or prompts. Adaptive prompts have shown promising results and could help shift mindsets and improve learning outcomes [10]. One type of notification would be based on performance on formative learning activities such as answering questions or completing tasks. For learners who indicated they had a fixed/entity mindset about learning and their abilities, the coach would periodically congratulate correct answers and remind the learner that learning is an achievable process. Incorrect responses would elicit prompts reminding the learner that mistakes are part of the learning process, and to keep going. The purpose of these PLC notifications is to shift to growth and incremental mindsets.

The PLC could also respond to the learner's progress by delivering prompts to help learners identify themselves as the active controller in the learning process. The causal attribution of success or failure can impact motivation for learners. Learners demonstrate more sustained effort and persistence when attributing success to internal forces, namely sufficient ability and reasonable effort [2]. If learners with fixed mindsets or low motivation can see their outcomes as a mix of their current knowledge and level of effort, then they can shift their mindset to understand that learning is controllable.

Using a learner's goals to reinforce motivation to learn is also a tool the PLC can act on. Every learner will have different goals for the content they are trying to learn, and the number and types of goals have shown to have an impact on how successful learners are [11]. The coach can use those goals to determine when and how to encourage continued engagement and reinforce goals. The coach can also use the learner's goals to cultivate motivation to learn by emphasizing authentic activities, phrasing goal statements in terms of learning accomplishments rather than tasks completed, revisiting goals post-activity, and creating summaries of the learner's accomplishments [2]. Each of these methods would be personalized to each learner depending on their profile and how the learner answers practice questions and works through the content.

The PLC would deliver the same validated surveys toward the end of the learning experience to determine if the adaptive prompts were able to successfully shift mindsets where applicable. Learners would be notified if their results changed. The PLC cycle is delivering surveys to generate a profile, tracking data from the native learning environment, adaptively delivering prompts, and re-evaluating learners. The PLC could do this process on many learning platforms for a single user.

IV. Further Research and Significance

Further research is needed to determine the technical requirements to develop an application such as this. The PLC would need integration tools for current learning technology, and a database to store user profiles and learning data. Machine learning tools would need to be tested to determine the best method of analyzing data and make decisions on the type of prompts to deliver. A review of artificial intelligence techniques could help the PLC determine when to deliver prompts to different types of learner profiles.

Any person of any age should know that learning is a process which is accessible and achievable. Children should grow up knowing that they can learn anything they set their minds to. Adults looking to grow or make a change in their lives should understand how best to engage with learning content. Research into learning mindsets and motivation have shown that certain beliefs and practices help people learn more efficiently, persist longer, and have better self-concepts [2]. Could an adaptive application incrementally improve global learning through surfacing mindsets, goals, and motivation to learners of all types?

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