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AI-POWERED EDUCATIONAL TOOLS AND THEIR EFFECT ON STUDENT MOTIVATION IN ONLINE LEARNING ENVIRONMENTS: A PRELIMINARY STUDY

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Abstract

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This thesis investigates the impact of an AI-powered educational tool on high school student motivation in asynchronous online courses using Self-Determination Theory (SDT) to examine perceived competence, autonomy, and relatedness. A pilot study involving 129 students utilized an AI-powered automated feedback (AF) writing review tool. Data was collected using the Autonomy and Competence in Technology Adoption (ACTA) Questionnaire and teacher communications. Findings indicate that AI tools can enhance perceived competence through immediate, personalized feedback. Still, the effectiveness is significantly influenced by the level of teacher communication, underscoring the need for a blended approach in online learning environments. Limitations include a small sample size and short duration, suggesting further research is needed. This study contributes to understanding how educators can balance AI and human feedback to enhance student motivation and learning outcomes in online learning environments.

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As educational technology evolves, it can reshape learning environments at all levels and modalities. High schools have increasingly turned to asynchronous online learning models, allowing students to engage with course materials and complete assignments on an alternative schedule as needed. Although this flexibility can be particularly beneficial for diverse student needs, it also introduces challenges around maintaining student engagement and ensuring educational quality. One emerging solution is Artificial Intelligence (AI) feedback tools. Educators in online classrooms can use these tools to enhance critical competencies and agentic learning in high school education. These AI tools that can provide prompt, individualized, and automated feedback can empower teachers to direct their attention to higher priority tasks. Leveraging technology in this way can help teachers scale up their impact, providing students with autonomy to seek immediate feedback and enhance their overall learning experience in their online classroom.

As a result of a limited pilot of an AI-powered writing review tool implemented by a small group of online high school teachers, the question of the students' perception of their motivation emerged. What impact does the use of this tool have on a student's engagement and perception of their performance in their asynchronous online course? This thesis examines that impact and focuses on the three fundamental aspects of motivation as defined by Self-Determination Theory (SDT): competence, autonomy, and relatedness. SDT suggests that optimal student engagement and learning occur when these three basic psychological needs are satisfied:

- Competence, or the ability to achieve and demonstrate a skill,
- Autonomy, or the freedom to control one's learning process,

- And relatedness, or the connection with others in the learning environment.

Problem Statement

Integrating AI tools into asynchronous learning environments presents a unique opportunity to investigate the psychological impacts on students, particularly in scenarios where traditional teacher-student interactions are already different than those experienced in the face-to-face classroom. This study addresses two key challenges: maintaining student engagement and ensuring educational quality in asynchronous settings and the need for scaling effective feedback mechanisms in online education. The central question is whether asynchronous online high school students' perception of motivation are impacted by feedback from an AI writing review tool.

Research Objectives

The goal of this study is to examine the impact of an AI-powered writing review tool on students' motivation as defined by Self-Determination Theory.

- Competence: examine whether the AI tool's feedback mechanism enhances students' sense of efficacy in their writing tasks, contributing to a perceived increase in competence.
- Autonomy: Assess how the immediacy and personalization of feedback from the AI tool help students feel more self-directed and less reliant on external validation from instructors, thereby satisfying a need for autonomy.
- Relatedness: Investigate how teacher communication about the AI-powered writing review tool fosters students' sense of connection with their instructors

and peers, enhancing their engagement and interaction within the online learning environment.

Significance

This study offers an opportunity to contribute to educational technology and pedagogical strategies to deepen educator and course designers' understanding of how they can leverage AI tools to enhance learning outcomes in asynchronous online environments. Through examining the effects of AI-driven feedback on student perceptions of competence, autonomy, and feelings of relatedness, the findings could inform thoughtful selection and integration of AI tools that are attuned to the psychological needs of students. In addition, there is an opportunity to enhance pedagogical strategies that focus on personalizing learning experiences and addressing the unique challenges of education and educational quality in settings where students learn independently of direct teacher oversight.

Additionally, implications for this research for using and integrating AI tools in online learning settings are substantial. As educators and institutions more frequently turn to digital solutions to supplement, and in some cases, replace traditional learning experiences, understanding the role of AI in supporting or undermining students' psychological needs becomes increasingly important. These initial inquiries do not intend to inform all AI implementations; instead add to the collective understanding of the ethical and effective integration of AI technologies in online education. AI technologies should aid rather than become barriers to student motivation and learning. By addressing the specific challenges of asynchronous online learning, such as the need for timely and effective feedback, this research could point toward the nuanced and supportive implementation of AI applications that foster a sense of capability.

Review of the Literature

Student Motivation and Engagement as Explained by Self-Determination Theory

Motivation, as explained by Self-Determination Theory (SDT,) is a multidimensional construct that includes intrinsic and extrinsic elements. This theory s comprised of five interrelated mini-theories: basic needs theory, organismic integration theory, goal contents theory, cognitive evaluation theory, and causality orientation theory.

Figure 1. The Five Mini-Theories of Self-Determination Theory (SDT) (Reeve, 2012)

These mini-theories collectively explain various motivational phenomena and the conditions influencing student motivation and engagement. For student motivation and engagement in their online course, this research focused on the basic needs theory- or the psychological conditions that support motivation. Motivation researchers break the concept into two general categories: intrinsic and extrinsic.

Engaging in activities for their inherent satisfaction and enjoyment defines intrinsic motivation, whereas extrinsic motivation involves performing actions to achieve distinct outcomes. Intrinsic motivation involves a perceived internal locus of control, where individuals feel their actions are aligned with their values and interests.

On the other hand, extrinsic motivation can vary in the degree of self-determination, ranging from external regulation, where behaviors are driven by external rewards or pressures, to integrated regulation, where behaviors are fully incorporated into one's self-concept and aligned with personal values (Deci & Ryan, 2012). Robust evidence exists confirming the association between intrinsic motivation and positive educational outcomes. Intrinsic motivation significantly correlates with academic performance, persistence, well-being, and adaptive goal orientations (Howard et al., 2021). For instance, intrinsic motivation was linked to deeper engagement and effort in learning activities and students taking a more active role in learning.

Researchers indicate that motivation primarily drives student engagement (Reeve, 2012). The Student-Teacher Dialectical Framework developed by Reeve highlights the reciprocal relationship between students and their learning environment. This framework posits that supportive classroom conditions, especially those that provide autonomy support, enhance student motivation and engagement, leading to better academic performance and well-being.

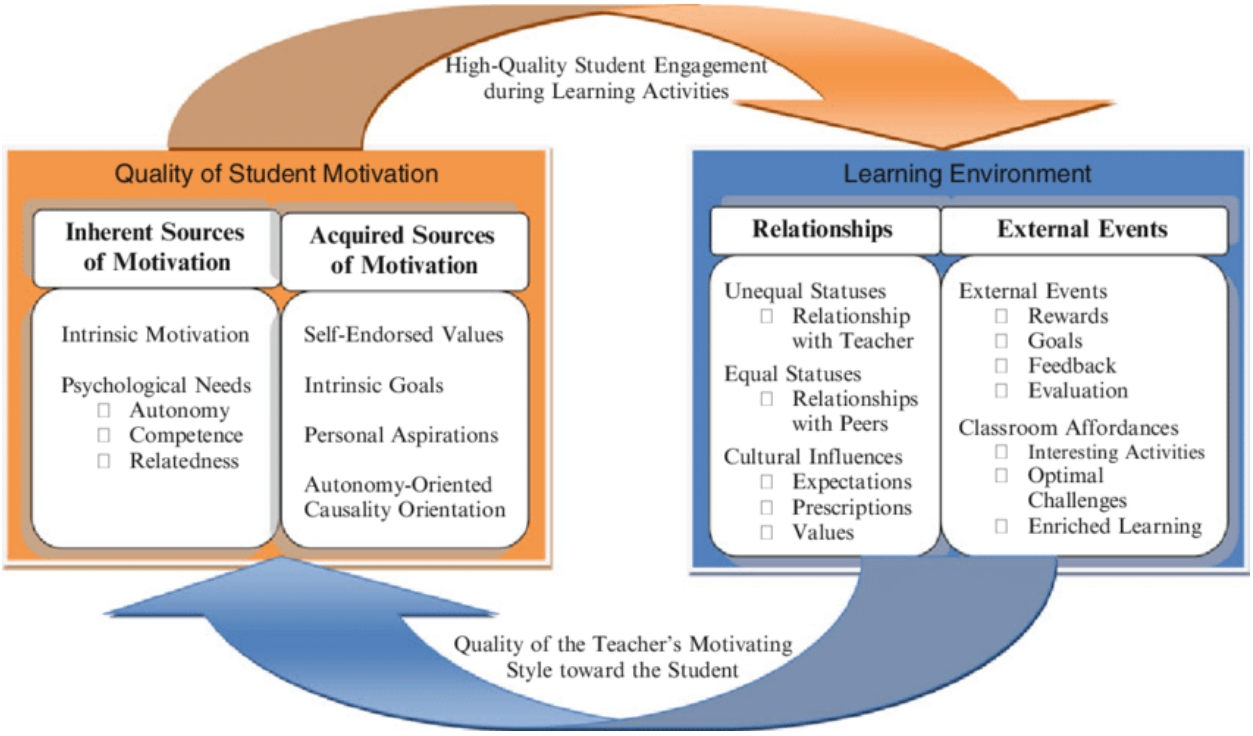

Figure 2. Student-teacher dialectical framework within self-determination theory (Reeve, 2012)

The critical components of the Student-Teacher Dialectical Framework include reciprocal interaction, autonomy support, student engagement, and a positive feedback loop. Understanding this framework in the context of motivation underscores the importance of fostering supportive teacher-student interactions. Teachers are crucial in creating conditions that meet students' basic psychological needs- autonomy, competence, and relatedness.

Engagement, a critical outcome of fulfilling these needs, is also a multidimensional construct that includes behavioral, emotional, cognitive and agentic aspects. High-quality engagement, driving by intrinsic motivation, improves learning outcomes (Reeve, 2012). Although each aspect of engagement plays a vital role in fostering high-quality learning experiences, agentic engagement is worth additional focus in this context. Agentic engagement involves proactive and constructive

contributions students make to the learning environment, including seeking out opportunities (including feedback) and taking responsibility for their learning.

The SDT framework posits that the three basic psychological needs- autonomy, competence, and relatedness, are essential for fostering motivation and well-being. These needs directly influence both motivation and engagement (Reeve, 2021). In an extensive meta-analysis on student motivation understood through the lens of SDT, Howard et al. (2021) explain that autonomy involves the perception of having control over one's behavior and decisions. Competence is a student's need to feel adequate and capable of achieving desired outcomes. Perceived competence is strongly associated with adaptive outcomes such as engagement, effort, and intention to persist in educational activities. The social environment influences autonomy and competence; contextual factors support these psychological needs and contribute to intrinsic motivation (Deci & Ryan, 2000 and 2012).

The satisfaction of these basic psychological needs mediates the relationship between contextual support and motivation in asynchronous online learning and face-to-face environments. Contextual support refers to the environmental and interpersonal conditions that help satisfy a student's basic psychological needs. These conditions can be provided through various strategies and interactions to promote student engagement and motivation in online courses. Examples of contextual support include instructor feedback mechanisms, announcements, and encouragement.

Specifically, support for autonomy and competency positively affected online students' perceived autonomy, competence, and relatedness in one study of 267 online students enrolled in online certificate programs at a large research university in the southeastern United States. The average age of participants was 37.8 years, which

presents an opportunity for further study of adolescents provided with similar supports in asynchronous online classes (Chen & Jang, 2010). In this study, instructors provided autonomy support through offering choice over learning activities, encouraging self-initiation of learning processes, and offering a rationale for tasks and assignments to help students understand the relevance of their work and foster a sense of ownership. Additionally, competence support was provided through clear instructions and expectations so that students knew how to achieve goals effectively. Teachers in this study provided constructive feedback regularly to help students improve their skills. Contrary to expectations, self-determined motivation did not predict the six learning outcomes examined (hours per week studying, number of hits on course materials, expected grade, final grade, perceived learning, and course satisfaction). The direct effects of contextual support on some learning outcomes (e.g., hours of studying per week and number of hits on course materials) were adverse. In contrast, the indirect effects of need satisfaction were positive. This combination of results was surprising and required further investigation.

In further research, Hui-Ching et al. (2019) made critical methodological corrections by treating self-determined motivation as a latent variable rather than an observed one. Chen and Jang (2010) calculated self-determined motivation using the Relative Autonomy Index (RAI) formula and treated the RAI as an observed variable. However, observed variables can lead to weaker estimates in Structural Equation Modeling (SEM) whereas latent variables, inferred from multiple indicators, provide more reliable and accurate measurements of constructs. Chen and Jang (2010) combined the three basic psychological needs into a single construct, which might have obscured the distinct effects of autonomy, competence, and relatedness as separate

constructs. Hui-Ching et al. (2019) employed a three-factor model, treating autonomy, competence, and relatedness as separate constructs. This allowed for a more nuanced analysis of their contributions to motivation and learning outcomes. These methodological corrections led to findings that better support the SDT framework, demonstrating that fulfilling students' basic psychological needs is crucial for enhancing motivation and achieving positive learning outcomes in online settings.

The relationship between perceived autonomy support form teachers and student curiosity further substantiates the connection between motivation and student success in secondary online settings. Zhao et al. (2010) focused on student curiosity, suggesting that when students feel they have control over their learning environment and perceive themselves as competent, they are more likely to experience curiosity. This curiosity, driven by an intrinsic desire to explore and learn, leads to deeper engagement and positive educational outcomes. It proposed and supported several hypotheses linking perceived autonomy, competence, and relatedness to intrinsic motivation and its outcomes, including flow state and enjoyment. The implications could help online educators support intrinsic motivation (autonomy and competence) by providing choice, transparent and timely feedback, opportunities for social interactions, and encouraging exploratory and flow experiences. In educational settings, including online classrooms, fostering curiosity involves providing opportunities for student choice, encouraging exploration, and offering optimally challenging tasks (Zhao et al., 2010).

Enhancing Student Motivation and Learning: The Critical Role of Feedback

In the context of SDT, the satisfaction of basic psychological needs significantly influences student motivation (Deci & Ryan, 2012). One of the fundamental mechanisms through which educators can support these needs is providing effective feedback (Reeve, 2012). Feedback is a tool for academic improvement and is critical in fostering intrinsic motivation and engagement (Ryan & Deci, 2000; Reeve, 2012). This section explores the multifaceted role of feedback in online learning environments, examining how leveraging feedback enhances student motivation and learning outcomes.

Feedback is one of the most potent influences on student learning. Providing effective feedback requires understanding foundational theories educational theories such as Vygotsky's Zone of Proximal Development (ZPD). Vygotsky (1978) proposes that learning occurs most effectively within the ZPD, where learners can accomplish tasks with the support and feedback from more knowledgeable others. This scaffolding process aligns closely with Hattie and Timperley's findings (2007) that feedback is a powerful tool for learning enhancement provided it is timely, specific, and process-focused.

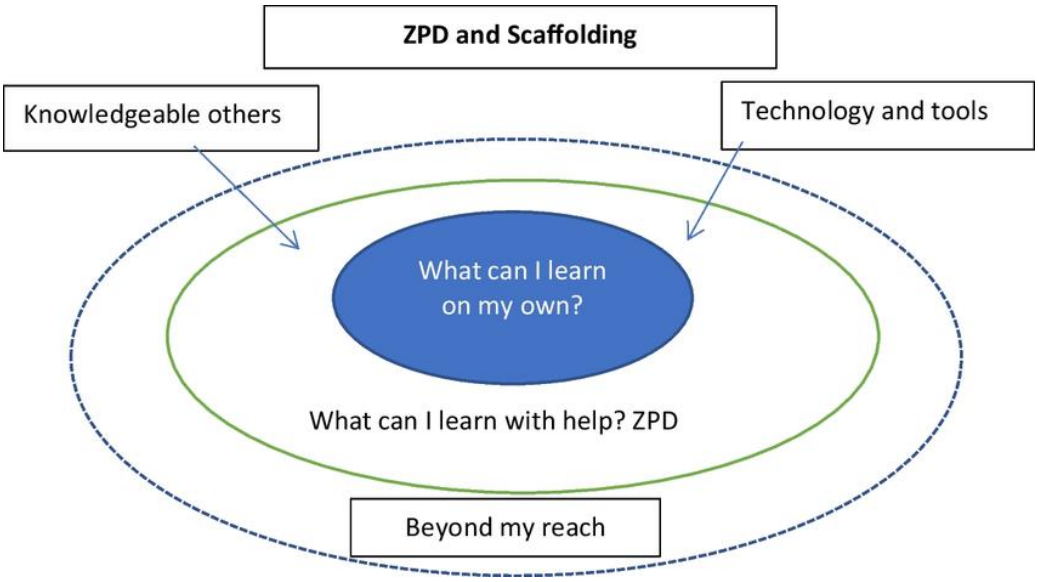

Figure 3. Zone of proximal development (adapted from Vygotsky, 1978).

Feedback significantly influences student achievement with an average effect size of 0.79, emphasizing its potential to positively impact learning outcomes (Hattie & Timperley, 2007). This finding aligns with Vygotsky's emphasis on scaffolding with the ZPD, where interaction and guidance from teachers or peers help learners internalize new knowledge and skills. Task-related, process-oriented feedback that fosters self-regulation is a critical mechanism for supporting learners as they transition from dependence to independence in their learning process. Such feedback addresses students' capabilities and guides them towards higher proficiency, directly supporting their perceived competence (Hattie & Timperley, 2007). Vygotsky's assertion that learning is a socially mediated process underscores the importance of feedback in helping learners internalize new knowledge and skills, achieving higher proficiency. The instructional model for student feedback processes proposed by de Kleijn (2023) builds on Vygotsky's premise that effective feedback processes occur in social interaction with the ZPD. The Instructional Model for Student Feedback Processes emphasizes the

importance of feedback literacy for students and teachers, advocating strategies that help students seek, process, use, and respond effectively.

Feedback is essential yet complex in online learning environments, involving various practices and understandings beyond traditional instructor comments provided in a face-to-face setting. Virtual learning environments where this feedback is necessary can be categorized into several types, including state-sanctioned virtual schools, university-based programs, consortium, and regionally-based virtual schools, and for-profit providers of curricula and infrastructure. In each setting, students may attend asynchronously, or in a blend of synchronous and asynchronous interactions. Students may be enrolled and attend courses entirely online, or use online courses to supplement their traditional face-to-face classes. It becomes clear from this variety that feedback strategies must be tailored to cater to student needs based on various factors, including their specific online setting and modality.

With a specific focus on students in grades 9-12, adults play a crucial role in online learning environments. The roles of course designers, administrators, and support staff are critical for providing the additional support necessary to facilitate effective learning and feedback through providing clear guidelines and structures for both teachers and students, which differs significantly from in-person learning settings (Cavanaugh et al., 2009; Jensen et al., 2021). Teachers must proficiently provide timely, specific, and actionable feedback, helping students understand their current performance and guiding them toward improvement (Jensen et al., 2021). Feedback in an online setting can be seen as a dialogue, where continuous interaction between students and educators fosters a more profound sense of understanding and competence. This metaphor resonates with Vygotsky's assertion that learning is a

socially-mediated process. A well-coordinated approach to feedback in online learning environments ensures that it is timely, specific, actionable, and supportive of student proficiency and competence.

To better understand the role of feedback in online learning, Jensen et al. (2021) provide a metaphor analysis that identifies six analogies that frame feedback practices.

- Feedback as treatment. Feedback is a powerful intervention that improves student performance. The role of the learner is passive, like a patient receiving treatment.
- Feedback is a costly commodity. It is an expensive resource that requires significant time and effort from instructors. The learner is seen as a feedback consumer, and its efficacy is often measured by cost and scalability.
- Feedback is coaching. It is developmental and motivational guidance aimed at helping students improve their performance. The learner is viewed as a performer who needs encouragement and constructive feedback to enhance skills and motivation.
- Feedback is a learner tool. It enhances learning and is effective only if the learner actively engages with it. Learners are viewed as responsible for their learning process.
- Feedback is a dialogue, an ongoing conversation between the teacher and learner. It is inherently reciprocal and iterative, a social interaction that builds relationships and co-constructs knowledge.

These metaphors provide a framework for understanding how feedback is perceived and implemented, as well as highlight different approaches. It can also guide practice so that

online educators can better understand how to evaluate and improve feedback practices (Jensen et al., 2021).

The Integration of AI-Powered Feedback Tools

To build on educators' diverse feedback metaphors and critical roles in online learning, those involved in online education must explore the opportunity to integrate artificial intelligence (AI) supported automated feedback (AF) tools into their learning environments. These tools represent a significant advancement in feedback practices, offering innovative solutions to the classroom challenges of scalability, timeliness, and personalization. This section will provide an overview of the current state of AI tools in education, review existing research on their effectiveness, and discuss the implications for student motivation and engagement through the lens of SDT.

The integration of AI-powered feedback tools, similar to, but not exclusively ChatGPT, introduces a new dimension to feedback in educational settings, whether online or face-to-face. Automated feedback tools are digital systems or applications that utilize AI to provide immediate, personalized, and scalable feedback on student performance and learning tasks. These tools are designed to expand the capacity of educators by offering detailed, consistent, and timely feedback and can address the need for individualized guidance. The primary functions of automated feedback tools include analyzing student work, generating responses that identify strengths and areas for improvement, and suggesting actionable steps for enhancement (Naz & Robertson, 2024; Oldham, 2024; Seo et al., 2021).

Özçelik and Yangın Ekşi (2024) conducted a case study investigating the role of ChatGPT as a learning assistant cultivating writing skills. Their findings highlight the

potential benefits of AI tools through enhancing self-editing skills and professional writing. The study revealed that ChatGPT aids in improving students' engagement and interest in writing tasks through providing timely and constructive feedback. However, the research also notes the necessity of practical prompt engineering to maximize the benefit of such tools. A nod to prompt engineering underscores the importance of training educators and students to utilize dialogical AI tools to foster improved writing outcomes effectively.

In the rapidly evolving AI-supported educational technology landscape, it is essential to note the difference between dialogical AI and AI-supported AF tools. Dialogical AI such as large language models like ChatGPT can engage users in interactive and reciprocal conversations and provides feedback that adapts based on the learner's queries. This interaction can foster a dynamic learning environment where learners can ask follow-up question and receive tailored guidance in real-time (Banihashem et al., 2024; Seo et al., 2021). In contrast, AI-powered feedback tools are designed to provide immediate, consistent, and scalable feedback without needing continuous interaction. These tools analyze student submissions and generate feedback based on predefined criteria, making them highly efficient for large-scale and asynchronous learning environments. They quickly deliver detailed and specific feedback (Escalante et al., Oldha, 2024; Naz & Robertson, 2024). Each type of tool has applications in educational contexts based on the goals the instructor has for student use (see Figure 4 below).

	Dialogical AI Tools	**AI-Powered Feedback Tools**

	Examples: ChatGPT, Gemini, Claude, Socratic	Examples: Hemingway Editor, Grammarly, Turnitin
Interaction	Two-way, conversational, simulates human-like interaction	One-way provides feedback or analysis without engaging in conversation
Depth of Analysis	Analyzes nuances of user input, including sentiment, intent, and underlying meaning	May employ basic natural language processing (NLP) techniques to identify keywords or patterns, but analysis tends to be more superficial
Intended Outcome	Engaging, personalized user experience, collaborative problem-solving, idea generation, and knowledge exploration	Quick, direct, criteria-based feedback, identifying errors, highlighting strengths, offering suggestions for improvement

Figure 4. Comparison of Dialogical AI Tools and AI-Powered Feedback Tools

The critical characteristics of AI-powered AF tools make them suitable for various educational applications. AF tools provide near-instant responses to student submissions, helping to accelerate the feedback loop and ensure that students receive prompt insights into their performance. This timeliness is crucial for maintaining student engagement and supporting continuous learning in an online setting (Naz & Robertson, 2024; Oldham, 2024; Seo et al., 2021). These tools can offer personalized

feedback tailored to individual student needs, handling large volumes of student work. The scalability of AI-powered AF fools contributes to more effective feedback for larger classes and asynchronous learning environments (Banishem et al., 2024: Pers, 2024). Additionally, the versatility of these tools means that they can be applied across subject areas and integrated into many types of classrooms, including different educational and developmental levels. Applications to writing feedback are significant, as the integration of this feedback loop catalyst can occur at any and all stages of the writing process including brainstorming, outlining, drafting, and revising (Buckingham Shum et al., 2023; Oldham, 2024).

A critical study in this area by Escalante et al. (2023) compares the efficacy of AI-generated feedback with human feedback on writing tasks. The findings suggest that while AI-generated feedback can be as effective as human feedback in certain aspects, combining both can enhance the overall quality of the feedback provided to the student. This comparison highlights the potential of AI tools to supplement (not supplant) human feedback in designated applications, particularly in large classes where personalized feedback may otherwise be limited. Additionally, AI tools are particularly beneficial in online learning environments where timely feedback is crucial for students to develop their persistence and resilience for learning tasks, contributing to more consistent engagement (Seo et al., 2021). This approach supports student autonomy, giving them a tool for seeking and receiving feedback on their own terms and schedule. It also helps to manage the logistical challenges of providing rich individualized feedback in online courses. Integrating AI feedback tools in asynchronous settings allows for scalable and near-immediate responses, ensuring learners receive prompt

insights into their performance and can make timely improvements (Naz & Robertson, 2024).

Blended feedback models that combine AI and human feedback leverage the unique strengths of both. AI tools excel in providing detailed and consistent feedback. They can analyze student writing quickly and deliver immediate responses. However, more than AI tools are needed to fully address the nuances of individual student needs. Human oversight is essential to provide the contextual and nuanced within the teacher-student relationship that AI-powered AF tools lack. Educators can interpret AI - generated feedback, add personalized comments, and offer emotional support that fosters a deeper understanding and connection with students (Seo et al., 2021; Banishem et al., 2024).

Several successful blended feedback models integrate AI with traditional feedback methods. Case students and empirical evidence highlight how these blended approaches can enhance the effectiveness of feedback in educational settings. For example, Buckingham Shum et al. (2023) discuss how teachers trained in feedback literacy can effectively use AI tools to provide comprehensive feedback. These educators can strategically plan and manage the feedback process, using AI to handle routine feedback while focusing on more complex and individualized student needs.

While AI tools offer significant advantages in educational feedback systems, they also come with several limitations that educators must address to ensure their effective and ethical use. One of the primary limitations of AI tools is their reliability and accuracy. AI can sometimes misinterpret student work, leading to incorrect feedback that may require teacher clarification to students. This is particularly problematic in complex tasks that require nuanced understanding an contextual awareness

(Banihashem et al., 2024). This limitation reduces the efficacy of AI tools in providing targeted, actionable feedback that students need to improve (Grassini, 2023).

AI tools in education also raise significant ethical concerns, particularly related to academic integrity and fairness. AI-generated feedback can sometimes lead to academic misconduct if students rely too heavily on these tools to complete their assignments, bypassing the learning process (Grassini, 2023). There are also concerns about the biases inherent in AI systems due to the data they were trained on. These biases can lead to unfair or discriminatory feedback, negatively impacting educational outcomes for certain groups of students (Oldham, 2024; Naz & Robertson, 2024; Grassini, 2023).

Best practices for integrating AI ethically with traditional feedback methods include establishing clear guidelines for using tools and ensuring that both students and teachers understand the capabilities and limitations of these technologies. Training and professional development for educators is crucial, as they need to be proficient in using AI tools and interpreting the outputs. Additionally, maintaining open communication channels between students and educators helps ensure that feedback is received, understood, and could be acted upon (Buckingham Shum et al., 2023). Human oversight and intervention remain crucial to mitigate these limitations and ensure that AI tools complement rather than replace the nuanced and personalized feedback provided by educators. These blended feedback models demonstrate that AI and human feedback are not mutually exclusive, but can work together to create a richer, more supportive educational experience for students.

Integrating AI feedback tools in online education environments could significantly enhance high school student engagement and motivation by supporting the psychological needs of autonomy, competence, and relatedness as defined by Self-

Determination Theory. AI tools can provide detailed, immediate feedback that enables students to take control of their learning process and foster a self-directed learning environment (Escalante et al., 2023; Naz & Robertson, 2024). This immediate response helps cultivate a sense of agency and self-regulation, which is essential for intrinsic motivation (Reeve, 2012). Additionally, consistent and constructive AI feedback could build student confidence and competence by offering regular, actionable insights and clear pathways for improvement, which are crucial for sustained engagement and academic success (Seo et al., 2021; Pers, 2024; Jia & Tu, 2024; Hattie & Timperley, 2007). The blended AI and human feedback approach strengthens the teacher-student relationship, providing contextually relevant and emotionally supportive interactions that could enhance relatedness and foster a collaborative learning environment (Escalante et al., Seo et al.; Oldham, 2024). Addressing the learning context is essential in shaping motivation and engagement, especially in online settings, where effective support strategies must meet learners' needs for autonomy, relatedness, and competence (Chen & Jang, 2010). By understanding and leveraging the strengths of both AI and human feedback, educators can enhance learning environments with increased potential to fulfill students' psychological needs and promote motivation and engagement (Howard et al., 2021).

Methodology

Participants

There were 129 potential participants identified for this study, dependent on their enrollment in an online class through the state virtual supplementary program. The administration of the state virtual school provided teachers with the option to run an AI

Essay Review tool pilot in their course in the spring semester, giving teachers complete control over how the tool was to be introduced and implemented. Five teachers determined to run the pilot in their asynchronous course(s). Two teachers implemented the pilot in two of their course sections. The courses are listed below.

- Dual Credit (DC) Education 101: Introduction to Education
- Advanced Placement (AP) Literature & Composition
- Single Semester Government
- AP Government B
- Creative Writing
- US History B

Three of the five teachers who initially determined to run the AI Essay Review pilot communicated and supported their students' use of the tool. However, the tool was enabled for all 129 students in the courses listed above, and could have been used outside of teacher guidance. Of those 129 students, 51 were made aware that they had access to the tool through various communication modalities. The final participant demographics of the volunteer study are listed in Figure 5.

Course Enrolled	**Gender**	**Grade**
American Government	F	11
AP Language and Composition	F	11
US History	F	11

Introduction to Education Seminar	M	12
US History	M	11
US History	F	11
AP Government	F	12
AP Government	F	12

Figure 5. Study Participant Demographics

Materials

The AI Essay Review Tool

The AI Essay Review tool used in the pilot was offered to students through an existing partnership with an online academic tutoring company named Tutor.com. Students can access synchronous academic support through live tutoring services 24 hours a day in most content areas and courses offered through the state virtual supplementary program. This tool is introduced to students in their online course orientation. It is always available via a clearly labeled icon and a simple single sign-on (SSO) process in the Learning Management System (LMS).

Teachers provided access to the AI Essay Review tool through the same process as students would use to access academic tutoring services, with one additional click. The online program's administrative staff enabled access on a student-by-student basis and provided directions to teachers once the tool was available to students enrolled in their courses. Students were provided with basic directions for accessing the tool from their teacher in a variety of modalities.

Tutor.com designed the AI Essay Review tool to offer AI-supported automated feedback for student writing rather than engaging in a dialogical process. The tool analyzes student essays

and provides feedback and guidance for improvement without back-and-forth interaction with a tutor or a teacher. The feedback generated by the AI tool focuses on various aspects of writing, such as grammar, coherence, and structure, providing students with immediate, actionable insights to improve their work. This non-dialogical approach ensures that all students receive consistent feedback, enhancing their ability to revise and improve their writing independently before submitting it to their teacher for assessment and additional feedback.

Measures and Instruments

Autonomy and Competence in Technology Adoption (ACTA) Questionnaire

The ACTA Questionnaire measures why people adopt a technology and their perceived competence. It is an ideal tool for assessing high school students' motivations and perceived competence in using technology within an online asynchronous learning environment. This choice is supported by several factors drawn from the broader literature on student motivation, technology adoption, and the specific needs of high school learners in online settings.

The ACTA Questionnaire is rooted in SDT, emphasizing the importance of autonomy, competence, and relatedness in fostering intrinsic motivation and overall well-being (Ryan & Deci, 2000). High school students in an online asynchronous class often require high self-regulation and intrinsic motivation to effectively engage with the course material. By focusing on autonomous and controlled motivations and perceived competence, the ACTA provides a comprehensive measure of the psychological factors crucial for successful engagement in an online learning environment.

High school students' adoption of learning technologies can be influenced by various motivational factors. The ACTA Questionnaire's focus on why students use technology (e.g., for its perceived usefulness or due to external pressures) and their

confidence in using it effectively is directly relevant to understanding how students engage with online asynchronous classes. This is particularly important given that successful technology adoption is critical for the effectiveness of online learning platforms.

Validation

The initial validation of the ACTA showed satisfactory internal consistency across its subscales, indicating that it is a reliable tool for measuring students' motivations and perceived competence (Deci & Ryan, 2004). Specifically, Cronbach's alpha values for the subscales ranged from 0.66 to 0.88, demonstrating that the instrument reliably captures different aspects of motivation and competence. Specifically, the alpha values are:

External regulation: 0.73

Introjected regulation: 0.77

Identified regulation: 0.80

Intrinsic motivation: 0.82

Research on student perceptions of online learning highlights the importance of perceived autonomy and competence in fostering positive learning outcomes. For example, Peters, Calvo, and Ryan (2018) emphasize that technology designs that support psychological needs enhance motivation, engagement, and well-being. Using the ACTA to measure these constructs can provide valuable insights into how well the online asynchronous class meets students' needs, thereby informing improvements and additions in context support like AI-supported feedback tools.

The asynchronous nature of an online class means that students must manage their learning schedules and motivations, often without immediate external reinforcement. The ACTA's detailed assessment of autonomous and controlled motivations and perceived competence aligns well with the demands of this learning context. It also allows educators, teachers, and course designers to identify areas where students may need additional support or where the technology might be improved to facilitate autonomous engagement and perceived competence. The focus of this mixed methods study, supported by the literature on feedback and AI tools, uses the ACTA to determine if the AI tool encouraged improved perceptions of student autonomy, competence, and relatedness, mainly through the lens of teacher communication.

The Questionnaire

The ACTA includes two main sets of questions:

Self-Regulation Questions: These items assess autonomous and controlled motivations for using an AI-supported writing Feedback Tool. Examples include:

- "I decided to use the AI Essay Review tool because it will help me do something important to me." (identified regulation)
- "I decided to use the AI Essay Review tool because I want others to know I use it." (introjected regulation)

Perceived Competence Questions: These items evaluate the user's confidence in using the AI Essay Review tool effectively. Examples include:

- "I feel confident that I'll be able to use the AI Essay Review tool effectively."
- "The technology will be easy for me to use."

Student participants view response items on a Likert scale, ranging from 1 (not true at all) to 5 (very true). Once complete, researchers average responses on the autonomous items to form the autonomous regulation score, and the responses on the controlled items are averaged to form the controlled regulation score. The score for the perceived competence items is the average of the responses.

Procedure

The ACTA questionnaire was converted to a Google form to facilitate simple distribution to all participants. This digital format ensured students could conveniently access and complete the questionnaire to return more responses. The form was distributed through the online virtual supplementary program's Student Information System (SIS), accompanied by a student-informed assent and parental consent form. The author designed both forms to be digitally signed, ensuring that all students (minors) who agreed to participate had obtained parental consent. This process ensured compliance with ethical standards and streamlined the data collection, making it accessible and manageable for students and researchers.

In addition to using the ACTA questionnaire, the study was incidentally able to observe the impact teacher communication had on students' adoption and use of the AI Writing Review Tool. This involved a detailed examination of the Learning Management System (LMS) through which students access their course content and where the teacher posts instructional narratives. The other communication route to students is via email through the Student Information System (SIS), where all communications are logged in the student's file. By tracking the frequency and type of communication presented to students participating in this study between these two methods,

comprehensive data was gathered on how often and in what manner teachers communicated with students about the AI tool.

Learning Management System (LMS)

Announcements: All announcements made in each course were examined to identify mentions of the AI Writing Review Tool. This included both general weekly announcements and specific notes about the tool.

Student Information System (SIS)

Emails: Email records for messages sent to students were searched to find references to the AI Writing Review Tool. This included personalized class-wide communications.

Results

This study emerged from a limited pilot of an AI-powered writing review tool offered to a voluntary group of online teachers and their students and utilized by an even smaller group of students when presented with the opportunity by their teacher. The primary research questions guiding this study are:

1. Competence: Do asynchronous online high school students feel more competent in their learning skills using an AI-powered writing review tool?

2. Autonomy: How does using the AI-powered writing review tool affect students' sense of autonomy in their learning process?

3. Relatedness: How does teacher communication about the AI-powered writing review tool enhance students' sense of relatedness in an asynchronous online learning environment, and how does this communication impact their engagement and interaction with the tool?

Self-Determination Theory (SDT) suggests that optimal student engagement and motivation occur when three fundamental needs are satisfied:

- Competence: the ability to achieve and demonstrate a skill.
- Autonomy: the freedom to control one's learning process.
- Relatedness: the sense of connection with others in the learning environment.

By focusing on competence and autonomy, this study sought to understand the psychological impacts of AI tools in asynchronous learning environments, where traditional teacher-student interactions differ significantly from those in face-to-face classrooms. The central aim is to investigate whether an AI writing review tool can help maintain student motivation and engagement, and ensure educational quality by providing feedback in a blended model enhanced by an AI-powered AF tool.

Given the insights from the literature, the findings also explore whether the AI tool, in conjunction with the teacher's role, can create a supportive learning context that enhances students' sense of relatedness. This blended human and AI interaction approach could be pivotal in fulfilling students' psychological needs and promoting motivation and engagement in online learning environments. Reeve (2012) emphasizes that student engagement is enhanced through supportive classroom conditions that provide autonomy support and foster relatedness through reciprocal interactions. In online settings, teachers may be able to encourage a sense of relatedness by

implementing learning contexts like AI-supported feedback tools that can provide individualized and immediate feedback. (Zhao et al., 2010; Seo et al., 2021; Escalante et al., 2023; Naz & Robertson, 2024).

Participant Demographics

The sample for this study consisted of 8 participants enrolled in 4 semester-based online asynchronous courses. The gender distribution among participants was 75% female (6 participants) and 25% male (2 participants). The participants were from two different grade levels: 62.5% were in 11th grade (5 participants), and 37.55% were in 12th grade (3 participants).

Participants were enrolled in courses such as American Government (1), US History (3), AP Government (2), AP Language and Composition (1), and Introduction to Education Seminar (1). Information about participants' prior experience with technology of AI tools was not explicitly collected; however, their decision to use or not use the AI Writing Review Tool suggests varying levels of familiarity and comfort with such tools.

Survey Response Rates

The survey included multiple items to assess participants' experience and perceptions of the AI Writing Review Tool. The response rates for each survey item varied, with some items having complete responses and others having missing data. The handling of missing data was handled as follows:

1. Gender and grade level: complete response rate.
2. Decision to use the tool: complete response rate.

3. Motivations for using the tool: missing responses.

Descriptive statistics were calculated based on available responses. Items related to motivation, regulation, and perceived competence had a response rate of 37.5%. This approach ensured that the findings were based on the best available information while acknowledging the limitations of a low response rate.

Key Findings

The following section presents the key findings from the study, focusing on participants' motivation and perceived competence in using the AI Writing Review Tool. These insights are derived from the analysis of survey data, including motivation and perceived competence scores, to understand better how students engage with AI tools in an online educational setting.

Motivation Scores

Participants' motivation to use the AI Writing Review Tool was assessed through Autonomous Regulation, Controlled Regulation, and the Relative Autonomy Index (RAI) to understand the intrinsic and extrinsic motivations driving students' use of AI tools.

The analysis of motivation scores revealed the following average values:

Index	**Average Score**
Autonomous Regulation Score	2.78
Controlled Regulation Score	3.53

Relative Autonomy Index (RAI)	-0.76

Figure 6.Average motivation item scores across all participants

The bar chart in Figure 7 visually represents these averages.

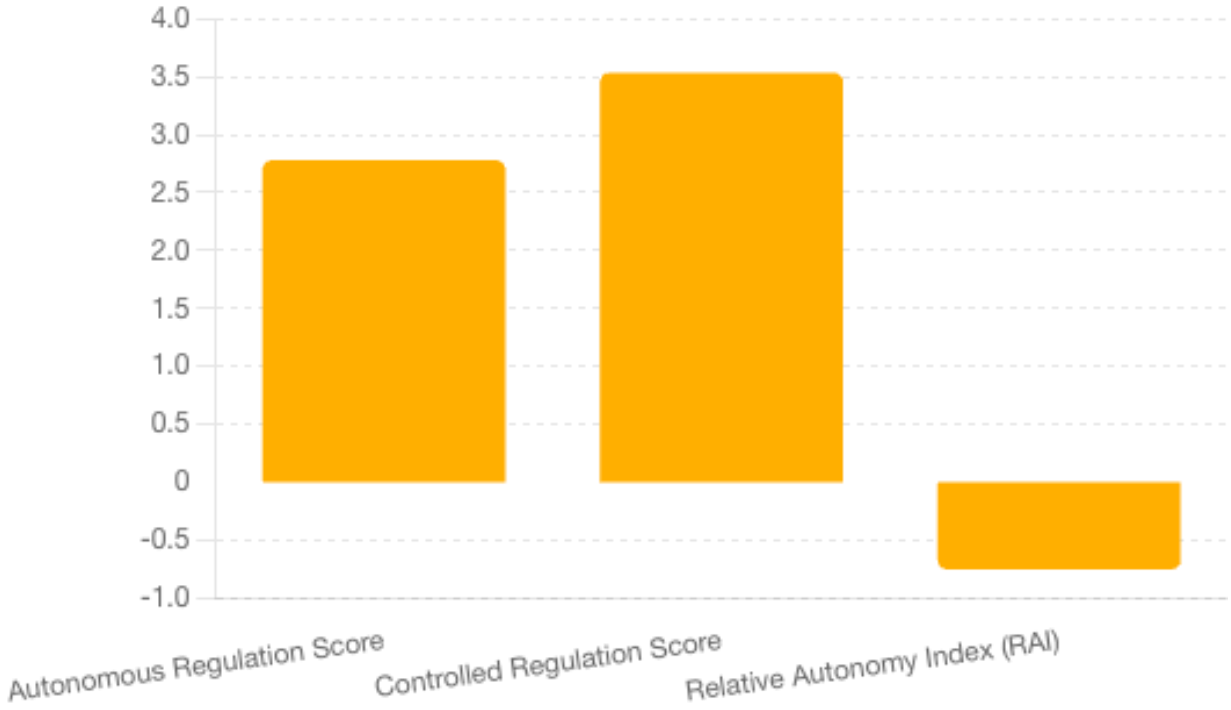

Figure 7. Bar chart of distribution of averages of motivation item scores

Perceived Competence Scores

This study also used the ACTA to examine participants' perceived competence. This metric is crucial as it reflects the students' self-efficacy and confidence in utilizing AI-supported feedback mechanisms. The distribution of these scores (Figure 8) indicates the participants' varying levels of perceived competence.

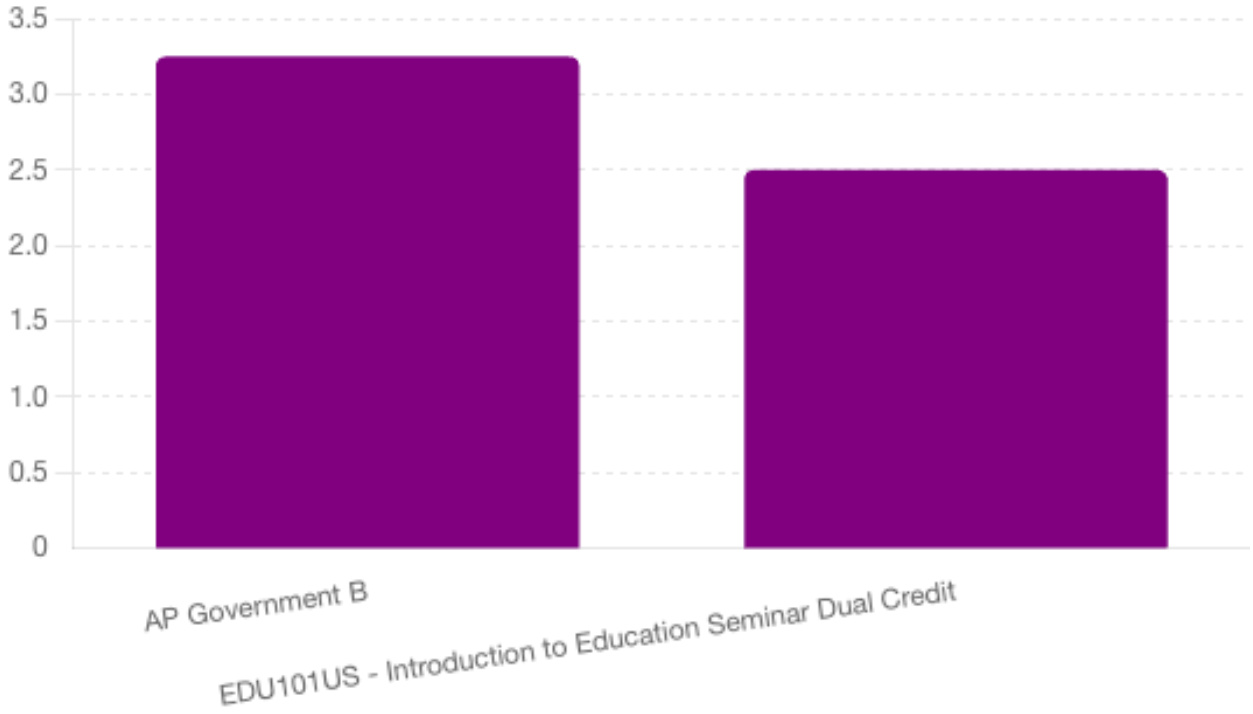

Figure 8. Perceived competence average scores distribution

Teacher Communication

The frequency and method of teacher communication about the AI Writing Tool significantly impacted students' understanding and perception of the tool. This factor was evident in the varying levels of motivation and perceived competence across different courses, listed in Figure 9.

Course	Teacher Communication	Freque-ncy	Autonomous Regulation Score	Controlled Regulation Score	Relative Autonomy Index (RAI)	Perceived Competence Score
US History B	None	0	N/A	N/A	N/A	N/A
Education Seminar	LMS and weekly emails	3	2.5	3.4	-0.9	2.5
AP Language and Composition	Weekly emails	4	N/A	N/A	N/A	N/A
AP Government	LMS, weekly emails, update	6	2.92	3.6	-0.68	3.25

Figure 9. ACTA scores and communication frequency by course

Explanation of the Relative Autonomy Index (RAI) Results

The Relative Autonomy Index (RAI) assesses the degree of self-determination in an individual's motivation. It is calculated by weighing different types of motivation along a continuum from controlled to autonomous. Higher RAI scores indicate a more autonomous form of motivation, where actions align more with personal interests and values. Conversely, lower or negative RAI scores suggest that motivation is more controlled and driven by external pressures or obligations (Deci & Ryan, 2000).

Calculation and Interpretation of RAI

The RAI is derived from a combination of scores on various types of regulation:

- Intrinsic Motivation: engaging in an activity for its inherent satisfaction.
- Identified Regulation: Recognizing the personal importance of a behavior and accepting it as one's own.
- Introjected Regulation: acting due to internal pressures, such as guilt or ego.
- External Regulation: being motivated by external rewards or punishments.

The RAI is typically calculated using the following formula:

$$RAI=(\text{Intrinsic Motivation}+\text{Identified Regulation})-(\text{Introjected Regulation}+\text{External Regulation})$$

Higher RAI values suggest that the behavior is driven more by intrinsic and identified regulation, indicating a higher degree of self-determination (Ryan & Deci, 2000).

Study Findings on RAI by Course

In the context of this study, the RAI results provide insights into students' motivational dynamics in different courses.

Education Seminar

The Education Seminar course had an RAI of -0.9. This negative RAI indicates that the student respondent in this course experienced more controlled than autonomous motivation. The relatively high Controlled Regulation score (3.4) compared to the Autonomous Regulation score suggests that this student felt external pressures or obligations to use the AI essay review tool.

AP Government

The RAI in the AP Government course was -0.68, which, while still negative, was higher than that of the Education Seminar course. This suggests that students in the AP Government course experienced a slightly better balance between autonomous and controlled motivations. The higher Autonomous Regulation score (2.92) and the relatively high Perceived Competence Score (3.25) indicate that those students felt more self-determined and competent.

Overall Trends

The limited data suggests that students who used the AI Writing Review Tool had varying perceptions of its impact on their competence, autonomy, and relatedness. These findings align with previous research indicating the potential benefits of AI tools in enhancing student competence and autonomy (Escalante et al., 2023; Naz & Robertson, 2024). However, the small sample size limits the ability to draw definitive conclusions.

Discussion

This study addressed a gap in the existing literature in secondary online education by leveraging SDT to evaluate AI-powered feedback tools and their impact on student motivation in asynchronous online learning environments. Unlike face-to-face educational settings, where immediate interpersonal interactions support fulfilling psychological needs, asynchronous online settings require different strategies to maintain student engagement and motivation. This study addresses gaps related to enhancing psychological needs for competence, autonomy, and relatedness, which are components of motivation (Peters et al., 2018). The study builds on the importance of

specific, timely feedback (Hattie & Timperley, 2007) and explores blended feedback models integrating AI's immediacy with teacher support (Escalante et al., 2023). Using the ACTA questionnaire provides insights into autonomous and controlled motivations, highlighting the role of teacher communication in supporting relatedness. Finally, the study briefly addresses ethical considerations of AI use in education, emphasizing responsible integration and human oversight (Özçelik & Yangın Ekşi, 2024).

Although the preliminary findings suggest that the use of an AI tool may positively impact students' perceived competence and autonomous motivation, the limited sample size prevents making definitive claims about the effectiveness of this tool paired with teacher communication. Further research with larger samples is needed to validate these trends. The study investigated the effectiveness of blended feedback models, combining AI-powered feedback with traditional teacher support, to see if they could be successfully combined to meet the psychological needs that underpin student motivation. The hypothesis was that immediate, personalized feedback from AI tools, supplemented by teacher communication, would positively impact students' competence, autonomy, and relatedness, enhancing their overall motivation and engagement in online learning.

Initial findings from this study suggest that AI-powered feedback tools may support psychological needs for competence. According to Peters, Calvo, and Ryan (2018), satisfaction with this basic need, along with autonomy and relatedness, is essential for motivation engagement and the well-being of digital experiences. The METUX model (Motivation, Engagement, and Thriving in User Experience) identifies six spheres of experience where technology can impact psychological needs: adoption, interface, task, behavior, life, and society. In the context of this study, the AI tool

primarily influenced the interface and task spheres by providing immediate, personalized feedback. This feedback has the potential to help students understand their strengths and weaknesses, fostering a sense of competence and confidence in their abilities. Although the limited sample size means the findings should not be generalized, the trends observed indicate that AI-powered feedback tools might be beneficial in enhancing students' perceived competence.

While the AI tool enhanced students' sense of competence, the study results indicate instances of controlled motivation, where students felt pressure from external sources to use the tool. This type of motivation, characterized by a sense of obligation, can undermine intrinsic motivation and reduce overall engagement. However, given the limited sample size, these findings should be interpreted cautiously as preliminary trends rather than definitive conclusions. Peters et al. (2018) highlight the importance of designing for autonomous motivation, where users feel a sense of willingness and volition in their actions. Autonomous motivation is fostered by learning environments that allow students to feel in control of their learning process. This includes offering choices in how and when to use the AI tool and ensuring that the tool aligns with students' personal goals and values. Further research with larger samples is needed to validate these preliminary trends and better understand how to optimize the use of AI tools in educational settings to support autonomous motivation.

The findings on motivation are indicative of potential trends, including the analysis of the RAI. High controlled regulation scores in both courses indicate that students felt pressure from external sources to use the AI tool. The negative RAI values suggest that students' motivation was more controlled than autonomous, contributing to the theory that students felt external pressures and obligations in their decision to use

the AI tool. The implications of these results could mean that intrinsic motivation was undermined, potentially leading to lower engagement and motivation to be involved in the learning process. Controlled motivation can also lead to short-term compliance (e.g., using the AI tool to meet perceived immediate requirements), and it may not foster long-term engagement and commitment to the course's learning objectives. For lasting educational benefits, fostering intrinsic motivation is crucial (Ryan & Deci, 2000; Hattie & Timperley, 2007).

Relatedness is the final component of motivation explored by this study. The study results indicate that the most conclusive finding is that teacher communication significantly impacted student adoption and engagement with the AI-powered feedback tool. Observations from the study support this conclusion. Courses with more frequent and personalized teacher communication saw higher engagement rates with the tool. The primary example is the American Government course, which featured the highest teacher communication and resulted in a higher average competence score of 3.25 and better overall engagement with the tool. Additionally, courses with less teacher communication had lower RAI scores, indicating more controlled motivation. This suggests that the absence of supportive communication may make students feel more pressured and less autonomously motivated to use the fool.

Effective teacher communication helps students understand the value and benefits of the AI tool, fostering a sense of relatedness and support. This aligns with the principles of SDT (Ryan & Deci, 2000). Fulfilling the need for relatedness is essential for motivation and engagement in digital experiences (Peters et al., 2018). The study's findings that higher teacher communication correlates with better student engagement support this notion.

Overall, this study highlights the importance of teacher support in fostering students' autonomy, competence, and relatedness in online learning environments where physical interaction is limited. In this study, teachers could implement the tool and communicate its usefulness to students at their discretion. Though the results are limited, they contribute to a better understanding of how the tool can empower students to take control of their learning, make meaningful choices, and feel connected to their educational experience. Reeve (2006) highlights the critical role of teacher support in fostering autonomy, competence, and relatedness. In the context of this study, the AI-powered feedback tool could be seen as a form of contextual support combined with effective teacher communication to support feelings of competence, autonomy, and relatedness. Teachers can enhance students' sense of autonomy by providing choices and encouraging self-directed use of the tool, framing it as a resource that students can use independently to improve their writing. Effective teacher communication may also help mitigate the effects of controlled motivation. Through the presence of emotional support and an emphasis on the learning process rather than performance outcomes, teachers may be able to help students internalize their motivation, making it more autonomous. This aligns with Reeve's (2006) findings on the importance of teacher support for fostering autonomy and intrinsic motivation.

In addition, the results of this survey suggest that teachers can help students understand how to use the AI tool effectively to receive specific, timely, and actionable feedback to identify areas of improvement before submitting their work to their teacher, fostering competence in their abilities. While the AI tool itself may not contribute to relatedness, its integration into the learning process in a blended approach, facilitated and

encouraged but not required by the teacher, can create a more supportive learning environment for students to enhance their self-directed learning skills.

Limitations

One significant limitation of this study is the small sample size, as it involved only 8 participants from various courses. This relatively small number restricts the generalizability of the findings to a broader student population and leads to less reliable statistical conclusions. Consequently, the ability to detect significant effects is reduced.

Another area for improvement is the limited diversity in courses and participants. The study included only students with teachers who volunteered for the pilot. This resulted in a narrow range of subjects and did not fully capture students' diverse experiences and perceptions across different disciplines and grade levels. Additionally, most participants were female (75%), which might skew results and fail to represent online high school students adequately.

The study's short duration is also a limiting factor. Conducted over a single semester, it may not provide sufficient time or evidence to observe the long-term effects of using AI tools on students' perceived competence and motivation. Longitudinal studies are needed to understand how these tools impact student learning and development over extended periods.

Another limitation is the absence of a control group. Without a control group of students who did not use the AI tool, it is challenging to attribute changes in perceived competence solely to the AI tool. Other factors, such as teacher support or students' prior familiarity with technology, could have influenced the results, making it difficult to isolate the tool's specific impact.

The study's reliance on self-reported data from the ACTA Questionnaire introduces potential biases. Self-reported data can be subject to biases where students might overestimate their competence to present themselves in a more favorable light.

Finally, variability in teacher communication presented an opportunity to explore the impact the teacher's influence had on tool adoption and engagement. However, this may have also complicated efforts to isolate the AI tool's impact.

Future research should consider several key areas to address these limitations and build on the trends suggested by initial findings. First, future studies should include a more extensive and diverse sample of students across grade levels and subjects. More diverse and more extensive samples would improve the generalizability of the findings. Also, conducting longitudinal studies that track students' perceived competence and motivation over multiple semesters or academic years would provide insights into the long-term effects of AI-powered feedback tools on student learning and development. Notably, an authentic student voice was missing from this study. Combining quantitative measures with qualitative approaches like interviews would provide a richer understanding of students' experiences and perceptions.

There are multiple opportunities to improve the implementation of the AI tool and address the findings of controlled motivation in future implementations. First, teachers and course designers should focus on providing more autonomy support, allowing students greater control over their use of the AI tool. Increased control could involve giving students a choice in how and when to use the tool and explaining its benefits to foster a sense of ownership and personal relevance (Reeve, 2006).

Additionally, it may be adequate to shift the focus from performance outcomes (like final grades on assignments) to the learning process to help reduce any inferred

pressure to use the tool. Encouraging students to use the tool to enhance their writing skills for their growth may foster more intrinsic motivation (Hattie & Timperley, 2007).

Finally, providing adequate training and familiarization sessions can help students feel more competent using the tool. When students feel confident in their ability to use the tool effectively, their motivation is more likely to be self-determined rather than controlled (Ryan & Deci, 2017).

Conclusion

This thesis investigates the impact of AI-powered feedback tools on student motivation and engagement in asynchronous learning environments. The primary objective was to determine whether these tools could enhance students' perceived competence, autonomy, and relatedness as outlined by SDT.

The findings indicate that AI-powered feedback tools have the potential to enhance students' sense of competence by providing immediate, personalized feedback. However, the student also highlighted the importance of teacher communication in supporting students' motivation, particularly in relating a sense of relatedness. Courses with higher levels of teacher communication saw better engagement with the AI tool.

These results suggest that integrating AI tools with effective teacher communication can create a more supportive and engaging learning environment. This has implications for online education, where maintaining student motivation is often challenging. The study contributes to the understanding of how AI tools can be used to support psychological needs and promote agentic learning.

The study's limitations include a small sample size, limited diversity in courses and participants, and a short study duration. These factors limit the generalizability of

the findings. Additionally, the absence of a control group makes it difficult to isolate the effects of the AI tool from other variables.

Conducting this research has been a powerful reinforcement of the necessity of a "human in the loop" approach to integrating AI-powered educational technology for online students for this author. The interplay between technology and pedagogy reinforces the importance of the teacher-student relationship. It provides opportunities for future work in this field as AI technology continues to develop at a feverish pace. Despite challenges such as limited participant availability and variability in teacher communication, the study highlights the potential of AI tools to enhance student learning when combined with adequate human support. By addressing both the technological and human aspects of education, educators can leverage AI tools to create more effective and supportive learning experiences.

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Table of Figures

Appendix

ACTA Questionnaire for Students

AI Writing Review Tools
Study Title: The Impact of AI Writing Review Tools on Online Student Motivation
Researcher: Caitlin Byers, MA Education, Phyllis J. Washington College of Education, University of Montana
Contact Information: caitlin.byers@umconnect.umt.edu

You are being invited to participate in a research study about the use of AI writing review tools by asynchronous online high school students. This study aims to understand how these tools affect students' perceptions of their writing skills, specifically focusing on aspects of competence and autonomy. Please read this form carefully and ask any questions you may have before agreeing to participate in the study.

Purpose of Study
This research is being conducted to gather insights into how AI writing tools influence high school students' feelings of competence and autonomy, which contribute to motivation.
If you agree to participate in this study, you will be asked to complete a 14 question survey. The survey will include questions about your experiences with using AI writing tools in your online class. The survey is expected to take no longer than 10 minutes.

Procedure
Your responses to this survey will be recorded for analysis, but will only be used for academic purposes. Your participation in this study is entirely voluntary. You may choose not to participate, and
you may withdraw your consent and discontinue participation at any time without penalty or effect on your final grade in this course.

Confidentiality
Your survey responses will be confidential. Any data collected will be anonymized before it is analyzed. Responses will be stored securely and will only be accessible to the research team. Results may be shared in academic settings, such as conferences or journal articles, but your identity will remain confidential.

Risks and Benefits
There are no direct risks to you participating in this study beyond those encountered in everyday life. Your participation will contribute valuable information that could enhance educational practices and support development in the field of educational technology. Should you have any questions about the study or your participation, feel free to contact Caitlin Byers at caitlin.byers@umconnect.umt.edu.

Student Assent
1. By typing your name below, you acknowledge that you have read and understand

the information provided above, any questions you have about the study have been answered to your satisfaction, and you agree to participate in this research study.

Questionnaire

There are a variety of reasons why students use an AI essay review tool. Please consider the following and indicate how true each of these reasons is for you.

I decided to use the AI Writing Review Tool provided by Montana Digital Academy in my online course.

I decided to use the AI essay review tool because other people wanted me to use it.

I decided to use the AI essay review tool because I expected it would be interesting to use.

I decided to use the AI essay review tool because I believe it could improve my life.

I decided to use the AI essay review tool because it will help me do something important to me.

I decided to use the AI essay review tool because I want others to know I use it.

I decided to use the AI essay review tool because I would feel bad about myself if I didn't try it.

I decided to use the AI essay review tool because I thought it would be enjoyable

I decided to use the AI essay review tool because I am required to use it.

I decided to use the AI essay review tool because it is going to be of value to me in my life.

I decided to use the AI essay review tool because I thought it would be fun to use.