FOSTERING SELF-EFFICACY THROUGH ARTIFACT CREATION IN A FULLY ONLINE DISTANCE HIGHER EDUCATION

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ABSTRACT

This study examines students' self-efficacy in relation to artifact creation within a Project-Based Learning (PjBL) approach in a fully online distance higher education context. In online learning environments, fostering learners' confidence in their ability to successfully complete academic tasks are pivotal for sustaining engagement and persistence. A mixed-method sequential exploratory design was employed. The qualitative phase explored students' experiences in completing project-based assignments that required the creation of learning artifacts. These findings informed the development of a quantitative pilot survey administered to 38 students, measuring motivation, perceptions of project-based learning, and self-efficacy using a Likert-scale instrument. Descriptive results indicate that students reported high levels of self-efficacy (M = 4.11, SD = 0.48), alongside strong motivation (M = 4.15, SD = 0.43) and highly positive perceptions of project-based tasks (M = 4.50, SD = 0.49). Correlation analysis revealed that self-efficacy was strongly associated with motivation (r = .738, p < .001) and moderately associated with perceptions of project-based learning (r = .539, p = .001). Regression analysis further showed that motivation significantly predicted self-efficacy (β = 0.900, p < .001), while perception of project-based tasks did not independently predict self-efficacy when controlling for motivation. These findings suggest that while artifact creation through PjBL is positively associated with students' self-efficacy, this relationship is strongly mediated by students' motivational engagement. The study contributes to understanding self-efficacy in fully online distance education and highlights the importance of designing project-based learning environments that simultaneously support meaningful task engagement and learner motivation.

Keywords: Artifact creation, project-based learning, online distance higher education, self-efficacy

ABSTRAK

Penelitian ini mengkaji efikasi diri mahasiswa dalam kaitannya dengan pembuatan artefak dalam pendekatan Project-Based Learning (PjBL) pada konteks pendidikan tinggi jarak jauh yang sepenuhnya daring. Dalam lingkungan pembelajaran daring, menumbuhkan kepercayaan diri peserta didik terhadap kemampuan mereka untuk berhasil menyelesaikan tugas akademik sangatlah penting untuk menjaga keterlibatan dan kegigihan. Penelitian ini menggunakan desain eksploratori sekuensial metode campuran. Hasil deskriptif menunjukkan bahwa mahasiswa melaporkan tingkat efikasi diri yang tinggi (M=4,11, SD=0,48), diiringi dengan motivasi yang kuat (M=4,15, SD=0,43) dan persepsi yang sangat positif terhadap tugas berbasis proyek (M=4,50, SD=0,49). Analisis korelasi mengungkapkan

bahwa efikasi diri berhubungan kuat dengan motivasi (r=,738, p<,001) dan berhubungan moderat dengan persepsi pembelajaran berbasis proyek (r=,539, p=,001). Analisis regresi lebih lanjut menunjukkan bahwa motivasi secara signifikan memprediksi efikasi diri (\beta=0,900, p<,001), sementara persepsi tugas berbasis proyek tidak memprediksi efikasi diri secara independen ketika motivasi dikendalikan. Temuan ini menunjukkan bahwa meskipun pembuatan artefak melalui PjBL dikaitkan secara positif dengan efikasi diri mahasiswa, hubungan ini sangat dimediasi oleh keterlibatan motivasi mahasiswa.

Kata Kunci: Pembuatan artefak, pembelajaran berbasis proyek, pendidikan tinggi jarak jauh daring, efikasi diri.

A. Introduction

The emerging tranformation of online learning in higher education has evolved not only how knowledge is delivered, but also how students engage with learning tasks and construct understanding. This transformation has been accelerated by global shifts toward digital education, particularly during and after the COVID-19 pandemic, which led to widespread adoption of online and distance learning modalities (Hodges et al., 2020; Martin et al., 2020). In fully online distance higher education settings, students are required to navigate learning more independently, often with limited immediate support from instructors and peers (Rasheed et al., 2020). Thus, students must develop confidence in their ability to manage tasks, solve problems, and persist through challenges, beyond acquiring content knowledge. This confidence, commonly referred as self-efficacy, plays a pivot role in determining how students approach learning, especially in online environments that demand high levels of autonomy (Bandura, 1977).

Self-effficacy, especially in online learning, becomes particularly crucial as students frequently encounter complex tasks with minimal direct supervision. Students who possess higher levels of self-efficacy are more likely to engage actively, deliver sustained effort, and persevere when dealing with difficulties, whereas those with lower self-efficacy may hesitate, avoid challenges, or disengage from learning activities(Bandura, 1977; Schunk & DiBenedetto, 2020). As in distance higher education institutions, students are expected to regulate their own learning processes and maintain motivation independently

(Zimmerman, 2000), thus making self-efficacy issue is highly relevant. The previous research also indicates that self-efficacy is a significant factor of students's perceived learning and satisfaction in online environments (Alqurashi, 2016).

To tackle these challenges, adopting instructional approaches that promotes active engagement and meaningful learning experiences is crucial. One such approach is Project-Based Learning (PjBL) which focuses on emphasize learning through the completion of authentic, problem-oriented tasks. PjBL has been shown to support deeper learning, enhance student engagement, and foster higher-order thinking skills by encouraging learners to construct their knowledge actively rather than passively receive information and knowledge (Chen & Yang, 2019). Within this approach, artifact creation becomes a central activity, where students produce tangible outputs that demonstrate their understanding and skills. Those practices align with broader pedagogical efforts to promote active and student-centered learning in higher education (Børte et al., 2023).

Learning through making manifests in the process of creating artifacts-such as designs, reports, or instructional products – has the potential to support self-efficacy development. Learning-through-making emphasizes the construction of tangible artifacts as a means of knowledge development (Halverson & Sheridan, 2014) . Through artifact creation, students are required not only to apply theoretical knowledge, but also to make decisions, solve problems, and reflect on their work. These experiences provide opportunities for mastery, which are central to the development of self-efficacy beliefs (Bandura, 1977). Moreover, sustained engagement in problem- and project-based learning strengthens students' internal locus of control, as these foster self-directed learning and build confidence and autonomy, particularly in higher education contexts (Clausen, 2023). In online environments, where direct interaction may be limited, artifact creation can serve as a concrete form of engagement that help students connect theoretical knowledge with practical application.

Nevertheless, the relationship between artifact creation and self-efficacy in fully online distance learning contexts remains underexplored. While project-based approaches are widely associated with active learning and skill development, empirical evidence on how these approaches influence students' confidence in their ability to learn and perform in online settings is still limited. In particular, it remains unclear whether engaging in artifact-based tasks directly enhances self-efficacy, or whether this relationship is shaped by other factors such as students' motivation and their perceptions of the learning experience (Alqurashi, 2016; Schunk & DiBenedetto, 2020).

This research is situated with an online tutorial course in a distance higher education institution, where Project-Based Learning was implemented through a series of assignments requiring students to create meaningful learning artifacts. The design of the course emphasized learning through making, encouraging atudents to actively construct knowledge while producing outputs that reflect their understanding. Within this context, it becomes important to examine not only how students perform, but also how they perceive their own capabilities during the learning process.

Accordingly, this study's purpose is to investigate students' self-efficacy in relation to their experience with artifact creation in a fully online learning environment. Specifically, it seeks to examine the extent to which self-efficacy is associated with students' motivation and their perceptions of project-based tasks. By focusing on self-efficacy as a central outcome, this study contributes to a more nuanced understanding of how learning through making can support not only cognitive outcomes, but also learners' confidence in their ability to succeed in online distance education.

B. Methodology

1. Research design

This study employed a mixed method sequential exploratory design (Sugiyono, 2020). The qualitative stage was conducted to explore students' experiences in completing project-based tasks that required the creation of learning artifacts in an online environment. Insights from this

phase were then used to inform the development of the quantitative instrument, particularly in identifying key aspects related to students' motivation, perceptions of project-based learning, and self-efficacy.

The qualitative phase was design to examine the relationship among these constructs, with a specific focus on understanding how students' experiences with artifact creation are associated with their perceived self-efficacy in a fully online distance learning context.

2. Participants

The participants in this study consisted of 38 undergraduate students enrolled in an online tutorial course in a distance higher education institution. The course implemented a Project-Based Learning (PjBL) approach, where students were required to complete assignments involving the creation of learning artifacts.

In terms of demographic distribution, the majority of participants were female (65.8%), while 34.2% were male. Most students were within the age range of 21-24 years., although participants from other age groups were also represented. This diversity reflects the typical characteristics of students in distance education, where learners often come from varies backgrounds and life stages.

3. Learning Context and Intervention

The study was conducted within a fully online tutorial environment, where learning activities were delivered asynchronously. The course design incorporated a learning-through-making approach, delivered through project-based assignments that required students to produce tangible artifacts. These artifacts were intended to demonstrate students' understanding of course concepts while encouraging the application of knowledge in meaningful and practical ways. Project-based learning enables students to engage in meaningful, authentic tasks that integrate knowledge and skills (Chen & Yang, 2019). Students were expected to independently engage with learning materials, complete project tasks, and submit their outputs through the online platform. The nature of these tasks required not only cognitive understanding but also creativity, problem solving, and self-management, making the learning

environment particularly relevant for examining self-efficacy.

4. Instrumentation

Data were collected using a structured questionnaire consisting of 26 Likert-scale items, designed to measure three main constructs: motivation (11 items), perception of project-based learning (4 items), and self-efficacy (11 items). All items were measured using a five-point Likert scale ranging from strongly disagree to strongly agree. The instruments used was validated by two experts of online instructional designers.

The qualitative phase findings assist the development of the instrument, ensuring that the items reflected students' actual learning experiences in the course. Several items in the self-efficacy scale were negatively worded, particularly those to anxiety and uncertainty. These items were reverse-coded during analysis to maintain consistency in interpretation, where higher score indicate higher levels of self-efficacy.

5. Data Collection

The questionnaire was administered at the end of the course, after students had completed the project-based assignments. This timing allowed participants to reflect on their full learning experience, including their full learning experience, including their engagement with artifact creation tasks and their perceived confidence in completing them.

In addition to the closed-ended questionnaire, open-ended questions were included to capture students' perspectives on the benefits, challenges, and suggestions related to the implementation of project-based learning in the online environment. These qualitative responses were used to support and contextualize the quantitative findings.

6. Data Analysis

Quantitative data were analyzed using descriptive and inferential statistical techniques. Descriptive statistics, including mean and standard deviation, were calculated to examine overall trends in motivation, perception, and self-efficacy.

To assess the internal consistency of the instrument, Cronbach's alpha was calculated for each construct as well as for the overall scale. Correlation analysis

using Pearson's correlation coefficient was conducted to examine the relationships among the three constructs.

To further explore the predictors of self-efficacy, a multiple regression analysis was performed, with self-efficacy as the dependent variable and motivation and perception of project-based learning as independent variables. This analysis aimed to identify the extent to which students' engagement and perceptions contribute to their confidence in completing project-based tasks.

Qualitative responses from the open-ended questions were analyzed using a thematic analysis approach. Responses were reviewed, coded, and grouped into recurring themes related to perceived benefits, challenges, and suggestions. These themes were then used to enrich the interpretation of the quantitative results, particularly in understanding factors that support or hinder the development of self-efficacy in the online learning environment.

C.Results and Discussion

1. Result

A total of 38 students participated in this study. The sample was predominantly female (65.9%), with male students representing 34.2% of respondents. The complete demographic characteristics of participants is shown below:

Table 1. Demographic Characteristics of Participants (N = 38)

Variable	Category	Frequency (n)	Percentage (%)
Gender	Female	25	65.8
	Male	13	34.2
Age Group	18-20 years	3	7.9
	21-24 years	21	55.3
	25-29 years	2	5.3
	≥ 30 years	12	31.6

The research instrument consisted of 26 Likert-scale items distributed across three constructs: motivation (11 items), perception of project-based tasks (4 items), and self-efficacy (11 items). This structure was designed to capture both students' effective responses and their perceived competence within a project-based online learning environment.

2. Reliability of the scales

Internal consistency was satisfactory for all three scales. The motivation scale showed acceptable reliability (Cronbach's α = .746), the perception scale showed strong reliability (α = .871), and the self-efficacy scale also showed good reliability (α = .795). When all 26 items were combined, the instrument showed very good overall reliability (α = .895). These results indicate that the questionnaire responses were sufficiently consistent for scale-level analysis.

3. Descriptive results

Overall, student responses were positive across all three measured construct. On a 5-point scale, the highest mean score was found for perception of project-based learning tasks (M = 4.50, SD = 0.49), followed by motivation (M = 4.15, SD = 0.43) and self-efficacy (M = 4.11, SD = 0.48). in practical terms, this pattern indicates that students not only viewed the project-based tasks favorably, but also reported strong confidence in carrying out those tasks in the online course context. Below is the table showing all three measured constructs:

Table 2. Students' response on all three measured constructs:

Construct	n	Mean	SD	Cronbach's alpha
Motivation	38	4.15	0.43	.746
Perception of project-based tasks	38	4.50	0.49	.871
Self-efficacy	38	4.11	0.48	.795

At the item level, the most positively rated statements were those related to independent effort and real-world relevance. The highest mean was for the item "I try to complete the tasks on my own before asking friends or the lecturer" (M = 4.74, SD = 0.50), followed by "Project-based learning assignments prepare me for real-world application." (M = 4.55, SD = 0.60). Very high agreement was also found for meaningful learning experience (M = 4.53, SD = 0.56) and being motivated and proud of the work produced (M = 4.55, SD = 0.60).

Within the self-efficacy domain, students reported especially strong confidence on positively framed items. For example, 89.5% agreed or strongly agreed that they were ready to face tutorial tasks in any form, 92.1% agreed or strongly agreed that

project tasks helped them master the course, and 92.1% also agreed or strongly agreed that they possessed the skills needed to complete the project-based tasks successfully. Confidence was also high for solving task-related problems (M = 4.34, SD = 0.63) and for believing that effort would lead to successful results (M = 4.34, SD = 0.67).

At the same time, the anxiety-related items showed more variation than the positively framed self-efficacy items. After reverse scoring, the lowest self-efficacy mean was found for anxiety about project tasks (M = 3.26, SD = 1.22), followed by anxiety before attending the course (M = 3.47, SD = 1.37). In the original response direction, this means that although the overall self-efficacy profile was positive, a meaningful minority of students still experienced uncertainty or nervousness when dealing with project-base tasks online.

Likert-scale results on project-based learning, motivation, and self-efficacy

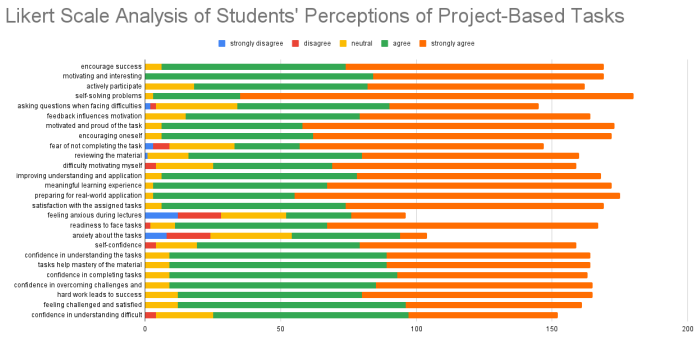

Figure 1. Distribution of students' responses across Likert-scale items on project-based learning, motivation, and self-efficacy

The distribution of responses across all questionnaire items further illustrates the overall positive pattern observed in the descriptive statistics (see Figure 1). The majority of items show a clear concentration of responses in the "agree" and "strongly agree" categories, indicating that students generally held favorable perceptions toward project-based learning tasks and reported high levels of motivation and self-efficacy in the online learning environment.

Items related to meaningful learning, real-world relevance, and independent problem-solving demonstrate particularly strong agreement, with minimal responses in the disagreement categories. This pattern suggest that students not only recognized the value of project-based tasks but also actively engaged with

them in a constructive manner. The dominance of positive responses across these items supports the argument that artifact creation within the project-based approach contributes to a meaningful and engaging learning experience.

However, a more varied distribution is observed in items related to anxiety and uncertainty. These items display a wider spread of responses across neutral and disagreement categories, indicating that not all students experienced the learning process with the same level of confidence. This variation provides important nuance to the overall findings, suggesting that while self-efficacy is generally high, some students may still encounter challenges when engaging with complex, project-based tasks in an online setting.

Overall, the response distribution highlights a consistent trend of positive engagement while also revealing areas where additional instructional support may be needed. This reinforces the interpretation that project-based artifact creation is associated with strong learner engagement and confidence, but its effectiveness depends on how well the learning experience is structured and supported

4. Corelation and Regression

Correlation analysis was conducted to examine the relationships among motivation, perception, and self-efficacy. As shown in Table 3, all variables were positively and significantly correlated. The results indicated that self-efficacy was strongly correlated with motivation ($r = .738$, $p < .001$) and moderately correlated with perceptions of project-based learning ($r = .539$, $p = .001$). In addition, motivation and perception were strongly correlated ($r = .772$, $p < .001$). These findings suggest that students who were more motivated and who perceived project-based tasks more positively also tended to report higher levels of self-efficacy.

Table 3. Correlations among Motivation, Perception, and Self-Efficacy

Variables	1	2	3
Motivation	—	.772***	.738***
Perception		—	.539**
Self-efficacy			—

Note. $p < .05$, $p < .01$, $p < .001$

To further examine the factors or predictors of self-efficacy, a multiple regression analysis was conducted with self-efficacy as the dependent variable and motivation and perception as independent variables. The model was statistically significant, $F(2, 35) = 21.18$, $p < .001$, explaining

54.8% of the variance in self-efficacy (R^2 = .548). As presented in Table 4, motivation emerged as a strong and significant predictor of self-efficacy (β = 0.900, p < .001), whereas perception of project-based learning did not significantly predict self-efficacy when controlling for motivation (β = -0.076, p = .668). These results suggest that while students' perceptions of artifact-based learning are positively associated with self-efficacy at the correlational level, motivation plays a more dominant role when both variables are considered simultaneously.

Table 4. Multiple Regression Analysis Predicting Self-Efficacy

Predictor	B	β	t	P
Motivation	—	.900	—	< .001
Perception	—	-.076	—	.668

Model summary: R^2 = .548, $F(2,35)$ = 21.18, p < .001.

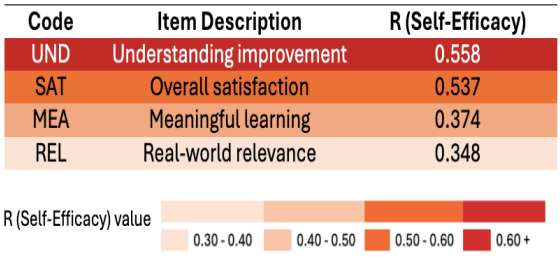

Figure 2. Heatmap of item-level correlation

To further explore the role of artifact-based project tasks, additional analysis were conducted at the item level. To highlight the relative strength of these relationships, Figure 2 presents a heatmap of item-level correlations. The visualization reinforces that perceived improvement in understanding (UND) and overall satisfaction (SAT) exhibit stronger associations with self-efficacy, as indicated by darker shading. In contract, meaningful learning (MEA) and real-world relevance (REL) show comparatively weaker, though still positive, relationships. This pattern suggests that immediate cognitive gains and effective responses to artifact creation may play a more prominent role in shaping students' self-efficacy than broader contextual perceptions.

All perception items were positively correlated with self-efficacy, including perceived improvement in understanding (r = .558, p < .001), meaningful learning experience (r = .374, p = .021), real-world relevance (r = .348, p = .032), and overall satisfaction (r = .537, p = .001). These findings indicate that students' positive experiences with artifact creation in project-based learning are associated with higher self-efficacy, although these effects are intertwined with motivational factors.

Finally, group comparison analysis based on gender and age showed no statistically significant differences in

motivation, perception, or self-efficacy. This suggests that the observed patterns were relatively consistent across different student groups within the sample.

5. Discussion

The study investigated how students' self-efficacy is associated with their experience of artifact creation within a Project-Based Learning (PjBL) approach in a fully online distance higher education context. Overall, the findings reveal a consistently positive pattern, with students reporting high levels of self-efficacy alongside strong motivation and highly favorable perceptions of project-based tasks. These results suggest that artifact-based learning environments can support learners' confidence; however, the mechanisms though which this occurs appear to be more complex than a direct effect.

First, the overall level of self-efficacy reported by students was relatively high, indicating that most participants felt confident in completing project-based tasks, understanding course materials, and applying their knowledge in practice. This is particularly noteworthy in a fully online distance learning context, where learners must rely heavily on self-regulation and independent engagement. Prior research has consistently shown that self-efficacy plays a crucial role in online learning success, influencing persistence, engagement, and performance (Hodges et al., 2020; Martin et al., 2020; Martin & Bolliger, 2018; Oliver et al., 2017). More recent studies also confirm that learners with higher self-efficacy are better able to navigate the demands of online environments and sustain engagement in complex tasks (Cheng & Xie, 2021).

At the same time, the item-level findings reveal a more nuanced picture. While students reported strong confidence on positively framed items, responses related to anxiety were more varied. A subset of students still experienced uncertainty when engaging with project-based assignments. This coexistence of confidence and anxiety aligns with recent findings that online learners often experience "productive struggle", particularly in open-ended and authentic tasks (Broadbent et al., 2021). Such findings highlight that self-efficacy is not a fixed state, but rather a dynamic construct shaped by task

complexity, prior experience, and available support.

Second, the relationship between artifact creation and self-efficacy appears to be indirect and strongly mediated by motivation. While perception of project-based tasks was positively correlated with self-efficacy ($r = .539$), it did not significantly predict self-efficacy in the regression model when motivation was included. Instead, motivation emerged as the strongest predictor ($\beta = .900$, $p < .001$). This finding is highly consistent with contemporary motivation theories, particularly expectancy-value theory, which posit that learners' beliefs about task value and their motivation to engage are critical determinants of performance and self-beliefs (Eccles & Wigfield, 2020).

This result suggest that artifact creation alone is not sufficient to foster self-efficacy. Rather, it is the motivational processes activated during engagement with these tasks that play a central role. In line with Social Cognitive Therapy, mastery experiences are the most powerful source of self-efficacy, but they must be meaningfully experienced and internalized by learners (Bandura, 1977; Schunk & DiBenedetto, 2020). In this study, artifact creation likely provided opportunities translated into self-efficacy only when students were sufficiently motivated to engage deeply with the tasks.

Third, the item-level correlations further clarify how specific aspects of artifact creation contribute to self-efficacy. Students who perceived project-based tasks as meaningful, relevant, and applicable to real world contexts reported higher self-efficacy. This finding aligns with recent research showing that authentic and contextually relevant tasks enhance both motivation and self-efficacy in online and blended learning environments (Howard et al., 2021). When learners recognize the value and applicability of what they are creating, they are more likely to invest effort and develop a stronger sense of competence.

The qualitative findings reinforce this interpretation. Students highlighted benefits such as improved understanding, creativity, real-world application, and active engagement. These themes closely align with the contemporary perspectives on project-based learning, which emphasize active knowledge construction and authentic problem-solving as key

drivers of meaningful learning (Guo et al., 2020; Martin et al., 2020). At the same time, challenges related to time management, clarity of isntructions, and technical constraints help explain the variability observed in anxiety-related items. These challenges are commonly reported in online PjBL settings and can negatively affect learners' confidence.

Taken together, these findings suggest that artifact creation in fully online PjBL environments functions as a contextual enabler of self-efficacy rather than a direct determinant. It provides opportunities for engagement, application, and problem-solving, but the extent to which these opportunities translate into self-efficacy depends largely on learners' motivational engagement and the quality of instructional support.

From an instructional design perspective, this has pivotal implications for online distance education. Simply assigning project-based tasks is insufficient. To effectively foster self-efficacy, artifact-based learning activities must be supported with clear instructions, structured scaffolding, and timely feedback. Research in online learning design consistently emphasizes the importance of guidance and interaction in reducing cognitive load and enhancing learner confidence (Gormally et al., 2009; Martin et al., 2020) Additionally, creating opportunities for peer interaction and instructor presence can help reduce anxiety and strengthen students' sense of competence.

Finally, this study contributes to the growing body of research on self-efficacy in online learning by highlighting the role of artifact creation within a distance education context. While previous studies have emphasized the benefits of active and authentic learning, the present findings demonstrate that their impact on self-efficacy is closely tied to motivational processes. In fully online environment, where learners operate with greater autonomy, designing for both meaningful engagement and sustained motivation is essential for supporting students' confidence and persistence.

D. Conclusion

This study set out to investigate how students' self-efficacy is associated with their experiences of artifact creation within a Project-Based Learning (PjBL) approach in a fully online distance higher education

context. The findings reveal a clear and consistent pattern: students reported relatively high levels of self-efficacy, alongside strong motivation and highly positive perceptions of project-based tasks.

Importantly, the results show that self-efficacy is not shaped by artifact creation in isolation, but is closely tied to students' motivational engagement. While students who perceived project-based tasks as meaningful, relevant, and applicable to real-world contexts also tended to report higher self-efficacy, regression analysis indicates that motivation is the strongest predictor of this confidence. In other words, artifact creation provides a meaningful learning experience, but it is students' active engagement and willingness to put maximum effort that most strongly support their belief in their own capabilities.

At the same time, the findings highlight a more nuanced reality. Although overall self-efficacy levels were high, some students still experienced anxiety and uncertainty when engaging with project-based tasks. This suggest that confidence in online learning develop alongside, rather than in the absence of, challenges. Factors such as unclear instructions, time constraints, and technical limitations may influence how students experience and respond to project-based activities.

All things considered, these findings suggest that artifact creation in a fully online distance learning environment can support the development of self-efficacy, particularly when tasks are perceived as meaningful and when students are actively motivated to engage with them. Nevertheless, the effectiveness of this approach depends not only on the presence of project-based tasks, but also on how these tasks are designed, supported, and experienced by learners.

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