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Assessing the psychometric properties of the intrinsic motivation inventory in blended learning environments

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Abstract

This study investigates the validity and reliability of the Intrinsic Motivation Inventory (IMI) in the context of blended learning. In the digital age, the fusion of online components with traditional classroom instruction has become integral to modern pedagogy, giving rise to blended learning—a flexible approach accommodating diverse learning needs. In such multifaceted environments, intrinsic motivation emerges as pivotal for sustaining student engagement, bridging the gap between in-person and online learning components. Utilizing a quasi-experimental quantitative research design, the research focuses on first-year university students enrolled in a blended learning economics course. Thorough statistical analysis affirms the IMI's effectiveness in accurately measuring intrinsic motivation levels within the diverse framework of blended learning. The findings not only validate the IMI as a tool for assessing intrinsic motivation but also underscore its importance for educators. Understanding students' intrinsic motivation is essential for tailoring instructional strategies, identifying at-risk students, and proactively preventing potential dropouts in blended learning environments. The validation of the IMI enhances the accuracy of assessments, interventions, and program evaluations, ultimately contributing to the improvement of education quality for students engaged in the integrated format of traditional and online instruction.

Keywords: Blended learning, Intrinsic motivation inventory, Intrinsic motivation, Reliability, Validity.

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Contents

Contribution of this paper to the literature

This paper validates the Intrinsic Motivation Inventory (IMI) as a reliable tool for assessing students' intrinsic motivation in blended learning environments. This validation enhances the existing body of literature by providing educators with a robust instrument for tailoring instructional strategies in blended learning environments, ultimately advancing the quality of education.

1. Introduction

Blended learning, the integration of traditional classroom instruction with online components (Kiketa et al., 2022), has become increasingly prevalent in educational settings, offering students a flexible and adaptive learning experience (Katal, Upadhyay, & Singh, 2023). Blended learning environments require students to navigate a diverse set of resources, often with a higher degree of self-directedness (Evenhouse, Lee, Berger, Rhoads, & DeBoer, 2023). Intrinsic motivation serves as a fundamental driver for students to actively participate in both in-person and online components of the learning process, ensuring sustained engagement (Yin & Yuan, 2021). It fosters a genuine interest in the subject matter, making students more inclined to complete assignments, participate in virtual sessions, and interact with course materials (AlGerafi, Zhou, Oubibi, & Wijaya, 2023). This inherent enthusiasm for the subject, which drives students to engage more deeply with their learning materials and activities, underscores the significance of effectively measuring intrinsic motivation. To this end, the Intrinsic Motivation Inventory (IMI) (Deci & Ryan, 1985) emerges as a pivotal tool, recognized for its ability to evaluate intrinsic motivation. The IMI Deci and Ryan (1985) is a widely recognized instrument and has been used across various contexts, including education, work, and sports. It was created by Deci and Ryan (1985) two prominent psychologists, as part of their work on Self-Determination Theory (SDT), which is a comprehensive framework for exploring the various aspects of human motivation (Ahmad, Webb, Desouza, & Boorman, 2019; Guo, Hu, Marsh, & Pekrun, 2022). The instrument has been used in various contexts, such as physical education (Cocca et al., 2022), clinical psychology (Rasul & Schwaiger, 2023) biology education (Gibbens, 2019) medical education (Cole, Chen, Ahmad, & Parikh, 2021). It is important to test the IMI's validity and reliability in a blended learning environment to make sure that it accurately measures intrinsic motivation in this new and changing educational setting. This process promotes more precise assessments, informed interventions, and effective program evaluations, contributing to the enhancement of blended learning initiatives and the quality of education provided to students. This study aims to determine the validity and reliability of the IMI instrument in blended learning environments. The research question for this study is: How valid and reliable is the Intrinsic Motivation Inventory (IMI) as an instrument for assessing students' intrinsic motivation in blended learning environments?

2. Literature Review

Intrinsic motivation represents the self-driven desire to engage in tasks and activities for their inherent satisfaction (Shahid & Paul, 2021). It is rooted in the innate human need for autonomy, competence, and relatedness, as outlined in Self-Determination Theory (SDT) by Deci and Ryan (1985). This form of motivation is characterized by a genuine interest and enjoyment in the task at hand, often leading to enhanced learning, creativity, and well-being (Van den Broeck, Howard, Van Vaerenbergh, Leroy, & Gagné, 2021). In the 21st century, intrinsic motivation has gained significant importance in various domains, particularly in education and the workplace. With rapid technological advancements and an evolving job market, the ability to pursue learning and work with intrinsic motivation is crucial (Dunn, 2020). This self-driven form of motivation fosters lifelong learning, adaptability, and resilience, traits highly valued in today's fast-paced, constantly changing world (Bella & Sentamilselvan, 2023). In educational settings, fostering intrinsic motivation is seen as key to developing autonomous learners who are better equipped to navigate the complexities of the modern knowledge economy (Bozkurt et al., 2020).

Blended learning is an educational approach that combines online educational materials and opportunities for interaction online with traditional face-to-face classroom methods (Kholifah, Sudira, Rachmadtullah, Nurtanto, & Suyitno, 2020). In blended learning settings, students have more control over factors like when, where, how, or at what the learning speed occurs. Blended learning models are diverse, ranging from flipped classrooms to fully integrated hybrid courses. Blended learning has become increasingly relevant in the 21st century, primarily due to the integration of technology in education and the growing need for flexible learning opportunities (Cruz & Dulay, 2023). It caters to diverse learning styles and provides a platform for personalized education, which is vital in today's diverse educational landscape (Singh, Steele, & Singh, 2021). The importance of blended learning was further highlighted by the COVID-19 pandemic, demonstrating its effectiveness in maintaining educational continuity in times of crisis (Ahmed & Opoku, 2022). Blended learning environments also prepare students for the digital workplace and foster skills such as digital literacy, self-regulation, and time management (Anthonysamy, Koo, & Hew, 2020).

The self-directed nature of blended learning necessitates that learners take increased ownership of their educational journey (Evenhouse et al., 2023). Students that are intrinsically motivated exhibit a remarkable propensity to proactively chart their learning path, guiding themselves to explore resources, establish personal objectives, and venture into subject matter well beyond the prescribed curriculum (Yin & Yuan, 2021). Intrinsic motivation also enhances adaptability (Tan, Lau, Kung, & Kailsan, 2019) which is much needed in blended learning environments (Kathpalia, Kiat, & Tom, 2020). Blended learning often introduces challenges such as technical issues, time management complexities, and the need to seamlessly transition between online and in-person components (Bekbaev & Menglibekov, 2023; Cruz & Dulay, 2023). When intrinsically motivated, students find the determination to persevere through these challenges, steadfastly upholding their commitment to the learning process (Ubaidullah, Hamid, & Mohamed, 2019).

A key benefit of intrinsic motivation in blended learning is its longevity (Mosalanejad, Abdollahifard, & Abdian, 2020). It leads to a deeper understanding of the content, ensuring that students retain knowledge and apply it even after the course concludes (Fandiño, Muñoz, & Velandia, 2019). This not only contributes to the

quality of education but also to lifelong learning skills. Additionally, intrinsic motivation aligns seamlessly with personalized learning (Bozkurt et al., 2020). Blended learning environments can provide students with the opportunity to explore topics and resources tailored to their individual interests and goals (Alamri, Watson, & Watson, 2021). Intrinsic motivation empowers learners to make choices that enhance their unique learning experiences (Bailey, Almusharraf, & Hatcher, 2021). By promoting intrinsic motivation, educators reduce their reliance on external rewards such as grades or certificates, which can lead to shallow learning and compliance-driven education (Harefa & Silalahi, 2020; Ubaidullah et al., 2019). This approach supports the development of authentic, self-driven learners who find intrinsic satisfaction in the learning process itself. It promotes a sense of autonomy and self-satisfaction (Ibrahim et al., 2023; Shin & Bolkan, 2021).

Students who are intrinsically motivated in a blended learning environment are more likely to experience a heightened sense of well-being, which in turn contributes to their academic performance and overall success (Alsalhi, Al-Qatawneh, Eltahir, & Aqel, 2021; Cao, 2023). The assessment of students' IM can be instrumental in tailoring instructional strategies to individual student needs. By understanding the varying levels of intrinsic motivation among students, educators can adapt their teaching methods accordingly. For instance, highly intrinsically motivated students may thrive in environments that offer more autonomy and self-directed learning, while those with lower intrinsic motivation may benefit from additional guidance and incentives to remain engaged (Fishbach & Woolley, 2022). Understanding students can serve as a predictive tool for identifying at-risk students in blended learning contexts. Students with lower intrinsic motivation levels may be more susceptible to disengagement or attrition (Back et al., 2022). By gauging IM, educators can proactively identify and support students who are at risk of losing interest or struggling, thus preventing potential dropouts (De Silva et al., 2022; Saqr, López-Pernas, Helske, & Hrastinski, 2023).

3. Methodology

3.1. Research Context

This study was conducted at a higher education institution in Africa. The participants were selected using convenience sampling, which involves choosing subjects based on their availability (Mweshi & Sakyi, 2020). The study's participants comprised students enrolled in a blended learning course in economics. The study was conducted over a period of two academic years. This compulsory first-year course has an annual enrolment of approximately 1400 students per year. Given the substantial number of students enrolling in this course, the students were divided into four groups, each randomly assigned to a specific instructor. The intervention was carried out by Facilitator A, one of the instructors responsible for teaching this module, during the second year of the study. Throughout the semester, the intervention incorporated cooperative learning strategies aimed at enhancing students' intrinsic motivation. The control group included all students from the first year and those assigned to the other three facilitators in the second year.

3.2. Research Design

This study employed a quasi-experimental quantitative research design featuring a non-equivalent pre-test, post-test control group design. The objective of this approach is to establish causal relationships through the manipulation of conditions (Barnes, 2019). In quasi-experimental designs, treatments are applied, akin to true experiments; however, participants are not randomly assigned to treatment groups. While various quasi-experimental designs exist, this study primarily adopts a non-equivalent pre-test and post-test control group design. This design utilizes existing, intact groups of subjects (Bloomfield & Fisher, 2019).

3.3. Participants

The categorization of participant groups was as follows:

Table 1. Participant groups.

Categorization of groups	
Control group	C1: Students who enrolled in the blended learning course for year 1 of the study and attended facilitator A's classes.
	C2: The remaining students who enrolled in the blended learning course for year 1 of the study.
	C3: Students who enrolled in the blended learning course for year 2 of the study but were not part of lecturer A's classes.
Experimental group	E3: Students who enrolled in the blended learning course for year 2 of the study but were not part of lecturer A's classes.

Recognizing the potential impact of the distinct origins of the two groups on the research's validity and reliability, the study implemented compensatory measures by using inferential statistics and control variables. Inferential statistics, including techniques like ANCOVA, were applied to effectively isolate and account for variations stemming from the different years in which the groups were enrolled.

To ensure maximum comparability between the two cohorts involved in the research, both groups completed the questionnaires during the same semester of each respective year, specifically in the second semester. This synchronized timing facilitated several critical conditions for comparison, including similar average ages, uniform study guides, consistent learning outcomes, equivalent contact hours, and identical lecturers responsible for conducting the classes for both groups. It is noteworthy that, out of the entire pool of completed questionnaires, only responses from 149 participants in the first year and 381 participants in the second year could be used for statistical analysis Table 1. This relatively limited subset of data can be attributed to two primary factors: (a) Incomplete Responses: Some participants completed either the pre-test or the post-test questionnaire, rendering them unsuitable for direct comparison. (b) Voluntary Participation: The completion of the questionnaires was entirely voluntary, with no penalties imposed on students who chose not to complete both questionnaires. This voluntary nature of participation further contributed to the relatively smaller subset of data available for statistical analysis. Table 2 presents the number of completed questionnaires used for this study.

Table 2. Number of completed questionnaires.

Group	Possible participants	Participants who completed pre-test	Participants who completed post-test	Participants who completed both
C1	782	587	356	107
C2	179	79	139	42
C3	985	452	549	257
E1	379	124	255	124

3.4. Measuring Instrument

Ryan (1982) developed the IMI, which served as the study's questionnaire. The IMI, originally published in the "Journal of Personality and Social Psychology," Volume 42, comprises 45 questions and employs a seven-point Likert scale for scoring. This comprehensive instrument is designed to assess respondents' intrinsic motivation by examining their levels of interest or enjoyment, perceived competence, effort, value or usefulness, felt pressure or tension, relatedness, and perceived choice while engaging in a particular activity. Consequently, the IMI yields six distinct subscale scores.

It is important to note that the IMI encompasses varying numbers of items from these subscales, and these items have demonstrated robust factor analytical coherence and stability across diverse tasks, conditions, and settings. Ryan (1982) suggests that, depending on the specific focus of a study, certain subscales may be used or excluded, emphasizing the need for investigators to conduct their own factor analyses based on their data.

The general criteria for the inclusion of items within subscales typically involve a factor loading of at least 0.6 on the relevant subscale, with no cross loading exceeding 0.4. In practice, the factor loadings often substantially exceed these criteria. The questionnaire's validity and reliability were tested in a blended learning environment, as will be discussed in the next section.

4. Results and Discussion

4.1. Validity

Validity is concerned with the extent to which scientific explanations align with real-world phenomena, thereby validating the accuracy of research findings and conclusions (Flake, Davidson, Wong, & Pek, 2022). Validity first includes the quality of scores yielded by the instrument used and, second, the quality of inferences that can be drawn from quantitative analysis results. In the quantitative domain, validity hinges on the concept that the scores obtained from participants effectively represent the construct under investigation (Flake et al., 2022; Pillet, Carillo, Vitari, & Pigni, 2023). In this study, the Intrinsic Motivation Inventory (IMI) was utilized to evaluate students' intrinsic motivation in a blended learning environment. The statistical tests were done on both the control and experimental groups. To validate the IMI, a confirmatory factor analysis (CFA) was conducted using the Analysis of Moment Structures (AMOS) statistical software package. Alavi et al. (2020) describe CFA as a theory-testing model that involves comparing the covariance matrix of the sample data with the theoretical structure of the instrument. This model is invaluable for assessing construct validity and testing the hypothesis regarding the factor structure of a measuring instrument. It examines variables like regression weights, inter-factor correlations, and fitness indices to determine whether the study data are consistent with the model that the IMI designers have proposed. According to Cohen's rules for interpretation, regression weights show how strongly a factor is linked to its underlying items, while correlations show how strongly two factors are linked. Correlations are categorised as small (0.1), medium (0.3), or large (0.5) (Brydges, 2019).

Additionally, model fit assessment, referred to as fit statistics, encompasses various statistical measures. It is recommended to report multiple fit indices from three broader categories. The study will talk about the root mean square error of approximation (RMSEA), the comparative fit index (CFI), and the minimum sample discrepancy (CMIN) divided by degrees of freedom (DF). Acceptable thresholds for a robust fit are presented in Table 3.

Table 3. Goodness of fit indices.

Indices	Acceptable value
CMIN/DF	≈ 2-5
CFI	>0.9
RMSEA	<0.08

Source: Hancock, Stapleton, and Mueller (2019).

The IMI questionnaire encompasses seven distinct factors, specifically *interest and enjoyment, perceived competence, effort, value and usefulness, pressure and tension, relatedness, and perceived choice.* The standardised regression weights for the IMI questionnaire are given in Table 4.

The analysis revealed that all regression weights associated with these factors exhibited statistical significance, characterized by a p-value less than 0.001 and estimates exceeding 0.37. Notably, the questions *made me feel like I had to do this.* And *I'd like a chance to interact with this person more often.* They displayed relatively lower standardized regression weights, measuring 0.29 and 0.25, respectively. These outcomes could potentially be attributed to a comprehension gap where students may not have fully grasped the intended meaning of these questions. The interrelation between the questionnaire's factors employed in this study is further detailed in Table 5, illustrating the correlation coefficients.

Substantial and statistically significant correlations, falling within the medium-to-large range, were observed among all factors. Notably, the factor "pressure and tension" exhibited negative correlations with all other factors, aligning with expectations. The evaluation of goodness-of-fit statistics involved the comparison between the specified covariance model and the data collected through the questionnaire used in this study. The model generated a notably high CMIN/DF value of 8.268, which can be attributed to the ample dataset (n = 1277) employed in this research. It is important to note that chi-square statistics tend to increase as the sample size grows. The model produced a relatively lower CFI value of 0.79. The presence of an acceptable RMSEA value of 0.075 and a 90% confidence interval spanning from 0.074 to 0.077, however, balances it. Despite the CFI falling

slightly below the recommended threshold of 0.9 for a four-factor model, the validity of the questionnaire used in this study can still be considered acceptable.

Table 4. The standardised regression weights for the IMI questionnaire.

Question			Estimate	P
I enjoyed doing this activity very much	-->	Interest/Enjoyment	0.739	***
This activity was fun to do.	-->	Interest/Enjoyment	0.819	***
I thought this was a boring activity (R).	-->	Interest/Enjoyment	0.826	***
This activity did not hold my attention at all (R).	-->	Interest/Enjoyment	0.499	***
I would describe this activity as very interesting.	-->	Interest/Enjoyment	0.535	***
I thought this activity was quite enjoyable.	-->	Interest/Enjoyment	0.889	***
While I was doing this activity, I was thinking about how much I enjoyed it.	-->	Interest/Enjoyment	0.880	***
I think I am pretty good at this activity.	-->	Perceived competence	0.372	***
I think I did pretty well at this activity, compared to other students.	-->	Perceived competence	0.861	***
After working at this activity for a while, I felt competent.	-->	Perceived competence	0.774	***
I am satisfied with my performance at this task.	-->	Perceived competence	0.748	***
I was pretty skilled at this activity.	-->	Perceived competence	0.716	***
This was an activity that I couldn't do very well (R).	-->	Perceived competence	0.840	***
I put a lot of effort into this.	-->	Effort	0.785	***
I didn't try very hard to do well at this activity (R).	-->	Effort	0.490	***
I tried very hard on this activity.	-->	Effort	0.752	***
It was important to me to do well at this task.	-->	Effort	0.489	***
I didn't put much energy into this	-->	Effort	0.510	***
I did not feel nervous at all while doing this (R).	-->	Pressure and tension	0.693	***
I felt very tense while doing this activity.	-->	Pressure and tension	0.705	***
I was very relaxed in doing these (R).	-->	Pressure and tension	0.667	***
I was anxious while working on this task.	-->	Pressure and tension	0.664	***
I felt pressured while doing these.	-->	Pressure and tension	0.517	***
I believe I had some choice about doing this activity.	-->	Perceived choice	0.562	***
I felt like it was not my own choice to do this task (R).	-->	Perceived choice	0.649	***
I didn't really have a choice about doing this task (R).	-->	Perceived choice	0.772	***
I felt like I had to do this (R).	-->	Perceived choice	0.290	***
I did this activity because I had no choice (R).	-->	Perceived choice	0.824	***
I did this activity because I wanted to.	-->	Perceived choice	0.527	***
I did this activity because I had to (R).	-->	Perceived choice	0.522	***
I believe this activity could be of some value to me.	-->	Value/Usefulness	0.839	***
I think that doing this activity is useful for [Self-directed learning].	-->	Value/Usefulness	0.842	***
I think this is important to do because it can [Help me become more self-directed in my leaning].	-->	Value/Usefulness	0.818	***
I would be willing to do this again because it has some value to me.	-->	Value/Usefulness	0.744	***
I think doing this activity could help me to [Help me become more self-directed in my leaning].	-->	Value/Usefulness	0.671	***
I believe doing this activity could be beneficial to me.	-->	Value/Usefulness	0.852	***
I think this is an important activity.	-->	Value/Usefulness	0.816	***
I felt really distant to this [My group members] (R).	-->	Relatedness	0.665	***
I really doubt that [My group members] and I would ever be friends(R).	-->	Relatedness	0.793	***
I felt like I could really trust [My group members].	-->	Relatedness	0.499	***
I'd like a chance to interact with [My group members] more often.	-->	Relatedness	0.251	***
I'd really prefer not to interact with [My group members] in the future (R).	-->	Relatedness	0.518	***
I don't feel like I could really trust [My group members] (R).	-->	Relatedness	0.693	***
It is likely that [My group members] and I could become friends if we interacted a lot.	-->	Relatedness	0.495	***

Note: *** $p<0.001$.

Table 5. Correlation coefficients of the IMI factors.

Factor			Estimate	P
Interest/Enjoyment	<-->	Competence	0.652	***
Interest/Enjoyment	<-->	Effort	0.615	***
Interest/Enjoyment	<-->	Pressure and tension	-0.390	***
Interest/Enjoyment	<-->	Perceived choice	0.432	***
Interest/Enjoyment	<-->	Value/Usefulness	0.631	***
Relatedness	<-->	Interest/Enjoyment	0.243	***
Competence	<-->	Perceived choice	0.263	***
Competence	<-->	Effort	0.418	***
Competence	<-->	Pressure and tension	-0.590	***
Competence	<-->	Value/Usefulness	0.431	***
Relatedness	<-->	Competence	0.244	***
Effort	<-->	Pressure and tension	-0.152	***
Effort	<-->	Perceived choice	0.277	***
Effort	<-->	Value/Usefulness	0.590	***
Relatedness	<-->	Effort	0.260	***
Pressure and tension	<-->	Perceived choice	-0.330	***
Pressure and tension	<-->	Value/Usefulness	-0.258	***
Relatedness	<-->	Pressure and tension	-0.384	***
Perceived choice	<-->	Value/Usefulness	0.339	***
Relatedness	<-->	Perceived choice	0.337	***
Relatedness	<-->	Value/Usefulness	0.273	***

Note: *** $p<0.01$.

4.2. Reliability (Internal Consistency)

Internal consistency characterizes the coherence, or conversely, the potential redundancy among the components of a scale (Flake et al., 2022). It can be conceptualized as the degree to which each item relates to every other item within the scale, as well as the relationship of each individual item to the entire set of items or the overall score (Diamantopoulos, Sarstedt, Fuchs, Wilczynski, & Kaiser, 2012). Once a factor structure has been validated, the assessment of internal reliability for each factor becomes crucial. In instances where an indicator comprises multiple items designed to measure a specific construct, it is imperative that these items exhibit a high level of congruity. The evaluation of this degree of similarity provides insights into the internal consistency of the measurement instrument.

Cronbach's alpha coefficient serves as the tool for quantifying this internal reliability and is derived from the inter-item correlations. When items demonstrate strong correlations with one another, their internal consistency is regarded as high, and the alpha coefficient approaches unity. Conversely, in cases where items are inadequately formulated and exhibit weak correlations, the alpha coefficient tends towards zero.

The formula for calculating the Cronbach alpha coefficient is:

$$r_n = \frac{k}{k-1}\left(1 - \frac{\sum v_1}{v_T}\right)$$

Where

r_n = The Cronbach alpha coefficient.

$\sum v_1$ = Sum of variances of the items in the factor.

k = Number of items in the factor.

v_T = Variance of the factor.

Table 6 shows the Cronbach's alpha coefficient values that are widely recognized as benchmarks in research. Traditionally, reliability estimates meeting or surpassing 0.80 are regarded as satisfactory, reflecting a robust degree of consistency in the measurement instrument. Conversely, values that dip below the 0.60 mark are generally perceived as inadequate, signifying a lower level of internal consistency (Maree & Pietersen, 2010).

Table 6. Acceptable values for goodness of fit indices.

Cronbach's alpha coefficient	Meaning
$\alpha \leq 0.5$	The scale has no internal consistency.
$0.5 \leq \alpha < 0.6$	The internal consistency of the scale is weak.
$0.6 \leq \alpha < 0.7$	The internal consistency of the scale is acceptable.
$0.7 \leq \alpha < 0.9$	The scale has internal consistency.
≥ 0.9	The internal consistency of the scale is high.

Source: Sürücü and Maslakci (2020).

Cronbach's alpha coefficient and the inter-item correlations of each of the IMI factors are presented in Table 7.

Table 7. Inter-item correlations of IMI questionnaire.

Factor	Cronbach's alpha coefficient	Mean of inter-item correlation
Interest/Enjoyment	0.893	0.556
Perceived competence	0.851	0.502
Effort	0.751	0.377
Value/Usefulness	0.920	0.630
Pressure and tension	0.781	0.418
Relatedness	0.641	0.195
Perceived choice	0.786	0.342

From Table 7, it becomes apparent that the reliability of six out of the seven factors is notably high. Each of these factors boasts a Cronbach's alpha coefficient equal to or exceeding 0.7, signifying a substantial degree of correlation among the constituent items within each factor. Furthermore, the mean values of the inter-item correlation for these factors consistently range between 0.15 and 0.55, reinforcing the presence of substantial correlations among these items.

Although the reliability for the relatedness factor measured a bit lower than 0.7, according to Field (2009) reliability lower than 0.7 can be expected for psychological constructs. Therefore, the questionnaire used for this study can be assumed to be reliable.

5. Findings

5.1. Validity

The core objective of this research was to determine the validity of the Intrinsic Motivation Inventory (IMI) in assessing student motivation within blended learning environments. Validity in quantitative research encompasses the credibility of instrument-generated scores and the legitimacy of inferences derived from these scores. To address this, a Confirmatory Factor Analysis (CFA) was employed. CFA, is a model that tests theoretical ideas by comparing the empirical covariance matrix to the theoretical structure of the instrument (Alavi et al., 2020). Our CFA on the IMI focused on examining regression weights, factor correlations, and fit indices. The standardized regression weights analysis (as depicted in Table 3) showed that there was a strong and statistically significant link between the questionnaire items and their corresponding factors, with all p-values being less than 0.001. However, certain items, notably the questions *I felt like I had to do this* and *I'd like a chance to interact with this person more often*, demonstrated lower weights, suggesting a potential misalignment in understanding these specific questions.

Inter-factor correlations were also analysed (Table 7), revealing meaningful and statistically significant associations. A notable finding was the negative correlation of the "pressure and tension" factor with other factors, suggesting an inverse relationship, as theoretically anticipated. Regarding model fit, the analysis yielded mixed results. The large sample size (n = 1277) mostly likely had an impact on the CMIN/DF value, which was relatively high at 8.268. Chi-square statistics are known to escalate with increasing sample sizes. The Comparative Fit Index (CFI) stood at 0.79, slightly below the ideal threshold of 0.9. An acceptable RMSEA value of 0.075 offset this, though. The 90% confidence interval for RMSEA ranged from 0.074 to 0.077, further substantiating the model's adequacy. The IMI demonstrated a generally acceptable level of validity for use in blended learning environments. The CFI did not meet the ideal standard, but the IMI is a good way to measure intrinsic motivation in these situations because it has significant regression weights, coherent factor correlations, and a satisfactory RMSEA. However, the differences seen, especially in the lower weights of some questions and the high CMIN/DF ratio, show that the results need to be carefully interpreted and the tool might need to be improved so it works better in blended learning settings.

5.2. Reliability

The reliability aspect of this study focused on evaluating the internal consistency of the Intrinsic Motivation Inventory (IMI) when applied in blended learning settings. Internal consistency refers to the homogeneity of items within a scale, indicative of how well these items measure the same construct (Flake et al., 2022). Central to this assessment was the use of Cronbach's alpha coefficient, a statistical measure that quantifies the extent of inter-item correlation and, by extension, the internal reliability of a scale (Field, 2009). The alpha coefficient ranges from 0 (no internal consistency) to 1 (perfect internal consistency), with higher values indicating stronger reliability. Table 7 presents the Cronbach's alpha coefficients and the mean inter-item correlations for each of the IMI factors. The results demonstrated high reliability for most factors. Factors like interest and enjoyment, perceived competence, value and usefulness, pressure and tension, and perceived choice exhibited alpha coefficients exceeding 0.7, indicating strong internal consistency. The effort factor, with an alpha of 0.751, also falls within the acceptable range of reliability. The mean inter-item correlations for these factors varied, yet consistently fell within the 0.15 to 0.55 range, further validating the reliability of these factors.

The relatedness factor presented a slightly lower alpha coefficient (0.641), indicating a moderate level of internal consistency. While slightly below the ideal threshold, this result is common in psychological construct and, as Field (2009) noted, can still be considered acceptable for such measures. The IMI therefore displayed high levels of internal consistency across most of its factors in the context of blended learning. The Cronbach's alpha coefficients, together with the mean inter-item correlations, underscored the reliability of the instrument in capturing various facets of intrinsic motivation among students in blended environments. The slightly lower reliability of the relatedness factor, while noteworthy, does not significantly detract from the overall reliability of the IMI in this context. These findings affirm the appropriateness of the IMI as a robust tool for assessing intrinsic motivation in blended learning settings.

6. Conclusion

This study delved into the intricate dynamics of intrinsic motivation within a blended learning environment, employing the IMI questionnaire to assess various facets of students' motivation. Through comprehensive

analyses, the study unveiled valuable insights into the relationships between intrinsic motivation and learning experiences within a blended learning setting, emphasizing the integral role of motivation in driving effective learning behaviours in this particular context. As the educational landscape continues to evolve, understanding the multifaceted nature of intrinsic motivation becomes increasingly paramount, particularly within the context of blended learning. By shedding light on the intrinsic motivational factors that influence student learning in blended environments, this study contributes to the ongoing efforts to refine and enrich the field of education in these technologically mediated settings. Moreover, it underscores the imperative role of intrinsic motivation in nurturing learners who are not only proficient in their studies but also capable of navigating the complexities of a rapidly changing knowledge landscape within the blended learning environment. This study, therefore, conclusively establishes the validity and reliability of the IMI for applications within blended learning environments.

6.1. Suggestions for Future Research

Future research could extend the application of the Intrinsic Motivation Inventory (IMI) to a wider range of educational settings and diverse student populations. Given the nuances identified in this study, particularly with lower-weighted questions like *I felt like I had to do this* and *I'd like a chance to interact with this person more often*, future research should focus on refining these items or developing additional questions that could more accurately capture the intended constructs. Studies could also explore how different cultural, socio-economic, and educational backgrounds influence intrinsic motivation in blended learning environments. Implementing longitudinal studies to track changes in student motivation over time would provide deeper insights. Such studies could show how intrinsic motivation changes over the course of a course or program and how various pedagogical strategies affect it. Further research could involve comparative analyses of intrinsic motivation in traditional versus blended learning environments. This could shed light on the specific aspects of blended learning that either enhance or impede intrinsic motivation. Exploring the role of emerging technologies, like Artificial Intelligence, in influencing intrinsic motivation in blended learning environments could provide insights into future educational trends and instructional designs. These suggestions aim to broaden the understanding of intrinsic motivation in blended learning, contributing to the enhancement of teaching and learning practices and the development of more effective educational tools and strategies.

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