Motivational beliefs, an important contrivance in elevating digital literacy among university students

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ABSTRACT

Students who are intrinsically motivated will frequently perform better than those who are not. This paper examined the relationship between motivational belief strategies and digital literacy in digital learning among university students. Motivational belief is an intrinsic motivation that encourages an individual to self-motivate through specific strategies. This paper has its aims to contribute to assisting students, and academics in utilizing the right motivational strategies to elevate students' digital literacy. Although there is a plethora of studies given students' motivation; studies of motivational belief strategies for elevating digital literacy are still rudimentary. To achieve the research aim, three hypotheses were formulated. A total of 583 respondents were analysed empirically using structural equation modeling-partial least-squares analysis. The findings of the study corroborate a positive and significant relationship between motivational belief strategies and digital literacy competency which signifies the important role of self-motivation in promoting digital literacy as well as preparing students to be a part of the digital future.

1. Introduction

Higher Education Institutions (HEI) around the globe were closed due to the Covid-19 pandemic outbreak. This prolonged closure has resulted in a major interruption in students' learning because of the sudden switch to digital learning as the learning mode. One of the consequences of university closures during the global lockdown due to the Covid-19 pandemic outbreak is that students suddenly find themselves having a lot more responsibility for their learning. Digital learning is defined as the broad term of learning with the use of digital technologies with flexible time, place, and learning pace in place (Anthonysamy et al., 2020) with many types of approaches such as blended learning and online learning (Kumar Basak, Wotto and Belanger, 2018). It has been posited that to make effective use of digital learning, one needs to have a certain level of digital literacy (Tang and Chaw, 2016). Living in a digital world does not imply that students are naturally digitally literate (Li and Ranieri, 2010). Despite having digital skills, many students lack digital literacy which is critical to performing effectively in digital learning (European Commission, 2020; Egan, 2020). Digital skills differ from digital literacy in that the former focuses solely on how to utilise technology, whilst the latter encompasses more than just that. A student’s digital skills, for example, can include understanding how to download an image to use in presentation software. Digital literacy, on the other hand, would entail learning how to select a suitable image, recognise copyright licencing, and obtain permission to use the image (Bali, 2016). As a result, many students, despite having digital skills, lack digital literacy, which is necessary for efficient digital learning. Additionally, many university students mainly apply digital skills on social networking sites and entertainment sites such as blogs (Anthonysamy, 2020) as they generally know how to access, create and share information online. Likewise, recent scholars have argued that digital literacy is not merely about the ability to make effective use of digital tools and information (Anthonysamy, 2020; Anthonysamy et al., 2020). It also comprises the demonstration of cognitive and socio-emotional ability when performing tasks online. For example, during the pandemic, students particularly, in developing countries struggle with online learning due to poor computer literacy (Selvanathan et al., 2020). Although students with high computer literacy can deal with online risks, they still struggle to learn in isolation during the pandemic (Purnama et al., 2021). Therefore, this adds to the urgent need for more studies to be carried out to ascertain how digital literacy competency can be elevated among university students (Greene et al., 2018; Anthonysamy, 2020; Anthonysamy et al., 2020). Such research is crucial since a possible solution is yet to be found concerning how to improve and advance digital literacy skills among students, especially since these skills are vital for employability (Gallardo-echenique et al., 2015; Anthonysamy et al., 2020; Anthonysamy et al.,...
2021). With hybrid learning being the new norm post-pandemic, acquiring digital literacy is an utmost an urgent as being digitally literate is more than just knowing how to use technology; it also means being able to think critically and effectively in a digitally enhanced environment, whether it’s in one’s personal life, educational life, or professional life. It also means that a graduate can use technology critically, deliberately, and responsibly in digital space. As such, one important unanswered question is whether intrinsic motivation serves to develop or deter the enhancement of digital literacy among university students. This warrants further investigation of the phenomenon so that better insight and understanding can be garnered.

1.1. Problem statement and research gap

This study builds on previous research with two contributions. First, addressing the lack of digital literacy deficiency among university students and its implications for digital learning and employability helps enrich the understanding of digital literacy effects. Second, the current study examines whether motivational belief strategies assist in the enhancement of digital literacy among university students. Researchers accentuate that motivational belief strategies are critical components of digital literacy (Greene et al., 2014; Anthonysamy et al., 2021). Motivational belief, which is a self-motivation strategy is indispensable in digital learning for successful learning (Huang et al., 2020).

Self-motivation has been noted by UNESCO through their report on Guidance on Active Learning at Home during Educational Disruption to be a critical skill that needs to be trained during this Covid-19 worldwide outbreak (Huang et al., 2020). Likewise, Van Laer and Elen (2017) postulated that students’ struggle with digital literacy can be reduced with the utilisation of motivational belief strategies. However, studies on the effects of motivational belief strategies on digital literacy are still rudimentary as there is a lack of research investigating the use of motivational belief strategies in elevating digital literacy competency among students (Anthonysamy et al., 2020, 2021). By addressing this gap, valuable information in terms of which motivational belief strategies have stronger associations with digital literacy skills for university students can be revealed. According to the United Nations Sustainable Development Goal (Target 4.4), young adults and youth are to have a substantial amount of digital skills relevant to the needs of industries and future employment by the year 2030. However, with perils mounting by the effects of the Covid-19 pandemic situation globally, university students are facing even more challenges in learning without the usual support from their lecturers, such as not engaging in the cognitive process effectively while using digital technologies, not being able to self-validate the suitability of online information, and not understanding the copyright issues when using digital information. A leading newspaper in Malaysia revealed that approximately 30% of young adults in Malaysia facing increased pressure and varying degrees of anxiety due to the pandemic (Tang and Chaw, 2016).

To extend the literature, the fundamental aim of this study is to examine motivational belief strategies as a self-acquired skill to enhance digital literacy competency among university students in Malaysia. Learning about the Malaysian context in this study offers a meaningful insight into the literacy field’s understanding of digital literacy from more global perspectives. The paper starts with a literature review of digital literacy and motivational belief strategies to formulate the research hypotheses. This is followed by the research method, results, and discussion. The last section presents the study limitation, future research direction, and overall conclusion of the study.

2. Literature review

2.1. The theoretical background of digital literacy

The digital literacy theory consists of two levels which are upper case (New Literacies) and lower case (new literacies) (Leu et al., 2009). Digital literacy falls in the lower-case category which means it is a smaller dimension than the broader concept of upper-case New Literacies (Leu et al., 2009). The collection of abilities required for an individual to access, navigate, comprehend, and contribute to the current digital information economy is known as digital literacy. To put it another way, it is the collection of skills required to participate actively in the modern Internet-mediated world. To be considered digitally literate, a person must know how to access information using modern digital technologies, how to navigate through the complex web of information made available by digital technologies, how to “read” and comprehend messages on digital media, and how to contribute to the digital information economy by using digital technology (Anthonysamy, 2020; Baron, 2019). As a result of the ever-changing technologies, the development of digital literacy can be enhanced through a shift in mindset. This digital mindset is necessary for learning because digital literacy is critical for the industrial revolution and the labour market (Gnaneswaran, 2017). The labour market has swiftly changed as a result of rising digitalization and the quickening growth of the digital economy since the turn of the twenty-first century, necessitating a workforce with significant digital capabilities. In the quickly evolving technology world of today, digital literacy has developed into a fundamental life skill that is necessary for both business and industry. Therefore, to remain academically active and engaged in digital learning environments, digital literacy skills are a necessity. The ability to search and critically examine digital information before integrating them into a meaningful output during digital learning requires motivational belief strategies (Greene et al., 2014).

Ng arrived at the theoretical model of digital literacy in 2012 (Ng, 2012) as presented in Figure 1. Ng concluded that there are three strands of literacies within the digital literacy competency which comprises technical literacy, cognitive literacy, and socio-emotional literacy. Technical literacy refers to procedural skills which involve the ability to operate and perform basic computing skills using a graphical user interface. In the aspect of learning, technical literacy is being able to use systems and software to manage and accomplish learning goals. Cognitive literacy deals with pedagogy concerns such as the use of critical thinking, logical reasoning, comprehension, and creativity to understand and retain information. Cognitive literacy in learning enables students to use their brains more effectively and subsequently helps students become fully engaged in their learning process. The socio-emotional literacy domain within digital literacy narrows down to understanding and being aware of the digital environment. It involves using the Internet responsibly for communicating, socializing, and learning through the sociology and emotional aspects of working with digital technologies. For example, being aware of online threats and traps is essential to avoid becoming a victim of scams and fraud. Another example is being able to demonstrate the right netiquette behaviour through the use of appropriate language and words when working in cyberspace.

2.2. Theoretical background of motivational beliefs

Self-determination theory (SDT) addresses individuals’ initiation of behaviour. SDT involves three types of motivation, namely a) amotivation b) extrinsic motivation and c) intrinsic motivation (Ryan and Deci, 2000). Intrinsic motivation has been revealed to provide the strongest drive compared to other extrinsic motivations because it deals with self-motivation (Vinther and Lauridsen, 2020). Self-motivation is an important skill that drives positivity in individuals to keep going even in the face of setbacks, persevere, and demonstrate commitment toward their goals. One example of intrinsic motivation is motivational beliefs which are socio-affective strategies to manage emotional factors in the students’ learning process.

2.3. Motivational beliefs

In a student’s learning process, motivation acts as a psychological supportive tool that becomes the reason a student strives to complete a
Motivation acts as another layer of support to positively push students to accomplish their learning goals (Panadero, 2017). Past works of literature have reported evidence of the influence of motivational beliefs on students’ willingness to learn (Pintrich, 1994; Pintrich and Schrauben, 1992). Students who are not motivated might result in negative consequences such as dropping out of class (Fryer and Bovee, 2016). Students with good utilisation of motivational belief strategies are capable of incorporating multiple components of attention, skills, and inhibitory control in learning (Lee et al., 2015). Additionally, motivational strategies are known to play a role in enhancing student engagement (Dumford and Miller, 2018; Pellas, 2014). This is probably because motivation increases students’ attention and focus, enabling them to utilise higher-order thinking skills and foster meaningful learning experiences.

Pintrich concentrated on three general motivational beliefs, namely (a) self-efficacy beliefs; (b) task value beliefs; (3) and goal orientations that are relevant to student learning (Pintrich, 1999) despite the many motivational models.

2.3.1. Self-efficacy beliefs

Self-efficacy is the individual’s belief in having the ability or the required skills to execute a given task (Bandura, 1986; Prior et al., 2016). The prevalence of technology later led to the introduction of the term “technological self-efficacy” by McDonald and Siegall (1992) which refers to the belief in one’s ability to successfully perform a task using technology to achieve a positive outcome. Students need to acquire self-efficacy in learning as it impacts their learning speed and progress. For example, a student who has high self-efficacy ability will put in the extra effort and go the extra mile to reach their learning goals even if they are faced with learning challenges, while those lacking in self-efficacy may have a negative or give-up attitude. Additionally, highly self-efficacious students may be able to directly boost their digital literacy competency because they are more confident, independent, and motivated to learn. Self-efficacy and digital literacy also appear to be significantly correlated in the literature where highly self-efficacious students were found to be more digitally literate, confident, independent, and motivated to learn (Prior et al., 2016). Similar findings were also found concerning technological self-efficacy and digital literacy where the two showed a significant correlation (Van Loon, 2001; Anthonysamy et al., 2020; Aslan, 2021).

2.3.2. Task value beliefs

Task value beliefs measure how much one values a specific task or skill in performing a certain task. Task value belief strategies encompass interest, utility value, and intrinsic value (Pintrich, 1999). Interest refers to the feeling of liking and wanting to know more about something. Utility value is the students’ subjective perceived usefulness which includes the belief that academic tasks can improve their performance or be useful to them. For example, students may feel like the assignment they are undertaking may help them with research abilities, life, or career progression. Task value beliefs can help reinforce students’ belief that the learning task is of value to them and will benefit them in some way or another. One study reported that task value belief strategies demonstrated an increase in the student’s willingness to learn, thus improving digital literacy (Anthonysamy et al., 2020; Gilbert, 2019).

2.3.3. Goal orientation

Goal orientation refers to the alignment of students’ mindsets in formulating goals when participating in digital learning. Scholars Wu, Yu, and Pintrich reported three general directions of goal orientation which are mastery, extrinsic, and relative ability (Wolters et al., 1996). Firstly, mastery goal orientation deals with mastering tasks using self-set standards. Subsequently, students’ success is measured in terms of self-improvement techniques. Secondly, extrinsic orientation uses good grades and pleasing others such as teachers and parents as a way to
evaluate student success. Thirdly, relative ability orientation refers to comparing one’s ability or performance to others and trying their best to do better than others on a task. It should be noted that in a traditional classroom, concern over social comparison is there; however, in a digital learning environment, this may not be the case. Goal orientation strategies have been reported in improving digital literacy among students (Anthonysamy et al., 2021; Hatlevik et al., 2015). Hypotheses and Research Framework Formulation.

Although previous studies have shown that motivational belief strategies have a significant positive correlation with digital literacy (Yang et al., 2014), there is still a need to provide more empirical evidence to examine whether motivational belief strategies are a key predictor in enhancing students’ digital literacy competence. In light of the aforementioned, the following hypotheses were constructed to examine the relationship between motivational belief strategies and digital literacy.

**Hypothesis 1.** (H1): There is a positive relationship between Technological Self-Efficacy and Digital literacy (DL) in a digital learning environment.

**Hypothesis 2.** (H2): There is a positive relationship between Task-Value beliefs and Digital literacy (DL) in a digital learning environment.

**Hypothesis 3.** (H3): There is a positive relationship between Goal Orientation and Digital literacy (DL) in a digital learning environment.

Figure 2 presents the conceptualised research framework.

### 3. Methods

#### 3.1. Design of the study

This study used the quantitative research design because the research objectives were to be addressed by numerical and numerical data. Quantitative research design was employed because it can accurately and systematically describe a population, situation, or phenomenon. The research design for this study utilised a survey method. Surveys are also able to examine and provide quantifiable relationships between psychological and sociological variables such as beliefs, attitudes, perceptions, and many others (Creswell, 2015). This approach is suited to the purpose of this study because the data collected from the survey was aimed at understanding university students’ motivational belief behaviour in acquiring digital literacy competency through their use of motivational belief strategies.

#### 3.2. Sampling frame

There are 83 private institutions in Malaysia, and 53 of them, or 63%, are located in the central area, according to the Malaysian Qualifications Register (MQR, 2021). The survey did not include the 53 foreign private HEIs in Malaysia, colleges, or university colleges. Thus, after excluding foreign private HEIs in Malaysia, colleges and university colleges, there was a balance of 35 universities and only seven private universities within the central region of Malaysia.

Only seven private institutions in Malaysia’s central area were chosen out of a total of 35 universities. To maintain quality uniformity among the chosen colleges, each was assigned a SETARA 2020 Tier 4, 5, or 6 ratings. To maintain quality uniformity among the chosen colleges, each was assigned a SETARA 2020 Tier 4, 5 ratings. According to six areas and the Malaysian Qualifications Framework, the SETARA grading system for higher education institutions in Malaysia evaluates the quality of instruction, research, and services offered by universities and university colleges. Three general domains are considered by SETARA to evaluate the effectiveness of teaching and learning: input (talent, resources, and governance), process (problems with the curriculum), and output (result) (the domain is on the quality of graduates and graduate satisfaction).

Purposive sampling was used in this study to sample participants, who were first- and second-year IT students. Data for this inquiry were gathered through purposeful sampling. Finding the people who can provide the most information to achieve the goals of the study is the main factor to be considered with purposive sampling. Purposive sampling has been utilised in a large number of studies in social science research, even though this sampling approach is more frequently used in qualitative research, and as a result, does not require a sample frame (Memon et al., 2017). The decision is justified by the fact that first- and second-year students struggle greatly with learning since they do not know how to apply effective learning techniques (Anthonysamy et al., 2020). While IT students maybe more skilled in employing digital technology, this only applies to digital skills or technical literacy. Digital literacy abilities, however, encompass a broader range of abilities. Numerous kinds of research data suggest that students lack the digital literacy necessary for digital learning (European Commission, 2020; Egan, 2020).

Since the survey was administered in May 2021, it can be assumed that students had one year of experience online since the lockdown was enforced in Malaysia in March 2020. Using the GPower programme, the sample size was computed using a 95% confidence level and a significance level of 0.05. A minimum sample size of 119 was recommended by Hair et al., 2018 (2016). In order to allow the conclusions made from this data to be generalised to a larger population, it was agreed that the sample size would be 700.

#### 3.2.1. Ethical approval

The study received ethical approval from the Multimedia University’s Research Ethics Committee (REC) in Malaysia (EA0102021), and participants’ informed permission was collected for the study. As a result, in order to gather data in accordance with research ethics, a formal written request was initially sent to the chosen universities to obtain consent. In May 2021, using Google Form, the finalised instrument was then disseminated to the intended sample online. 712 responses were gathered. Five hundred eighty-three rows of data were declared prepared for analysis after filtering and data cleaning.

![Figure 2. Proposed research framework.](image-url)
3.3. Instrumentation and constructs

The questionnaire that was developed in this study was based on extant literature with the scales adapted from two validated sources; one for motivational belief scales (Pintrich et al., 1991; Dowson and McNerney, 2004) and the other for digital literacy scales (van Laar et al., 2017; Ng, 2012). This study adapted the items into an online learning environment because the motivation beliefs domain’s original items were utilised for traditional learning. During the revision process, things that are pertinent to the study’s context were chosen. The measured constructs were then organised into an Excel matrix. The original elements were finally mapped to the measured constructions. Table 1 contains the list of the items used and the constructs they reflected.

3.4. Data analysis techniques

This study has employed variance-based partial least squares structural equation modelling (PLS-SEM) using SmartPLS (3.0). This method involves a two-step analysis which is the measurement model and structural model. The measurement model measures the latent variables while the structural model tests all the hypotheses and path analysis. PLS-SEM is suitable for this study because the research aim is prediction-oriented.

4. Results

A total of 583 participants responded to the survey, where 396 (68%) were male students and 187 (32%) were female students between the age group of 19–22 years of age. All students experienced digital learning approach where courses have taken used a combination of face-to-face teaching and digital learning. Therefore, respondents for this study were exposed to digital technologies for learning.

4.1. Data assessment for normality

The normality of data was assessed using multivariate skewness and kurtosis Mardia’s coefficient evaluation where non-significance indicates adherence to the normality assumption. Figure 3 shows the results of the normality assessment where Mardia’s multivariate skewness ($\beta = 3.797$, $p < 0.001$) and kurtosis ($\beta = 73.619$, $p < 0.001$) indicated that the data distribution was non-normal. The cut-off value for skewness is $\pm 3$ and kurtosis is $\pm 7$ (Cain et al., 2016). Values beyond the cut-off values are suggested to proceed with PLS approach which is a non-parametric software. Since PLS-SEM does not assume the data to be normally distributed, PLS-SEM relies on a nonparametric bootstrap procedure to test coefficients for their significance (Hair et al., 2017).

4.2. Measurement model assessment

Measurement model delivers empirical measures of the relationships between the indicators and constructs. The process involves separate assessments such as composite reliability to evaluate the internal consistency reliability and validity, AVE to measure the convergent validity and VIF assesses the collinearity among the indicators of a formative construct, which is digital literacy in this study. The reliability and validity of constructs are measured to ensure their inclusion suitability in the path model. To evaluate the convergent validity of reflective constructs, the outer loadings and average variance extracted (AVE) were evaluated. The rules of thumb to accept factor loading of items vary across the literature. This study considered accepting factor loading of 0.6 and above (Byrne, 2016) as presented in Table 1 and Figure 4. Additionally, Table 1 shows all AVE values achieving the desired value of 0.5 and higher (Hair et al., 2017). Although the traditional criterion for internal consistency is Cronbach Alpha (CA), recent research reveals it is more appropriate to apply composite reliability as a measure of internal

| Construct                  | Item                                                                 | Loading | AVE    | CR     | VIF   |
|----------------------------|----------------------------------------------------------------------|---------|--------|--------|-------|
| Motivational Beliefs        | MB1: I am confident I can learn how to do an online task on my own   | 0.890   | 0.819  | 0.900  | 1.692 |
|                            | MB2: I am confident I can complete my online tasks well.              | 0.920   |        |        |       |
| Task Value Beliefs          | MB3: I am interested to learn from any online task because I believe it is important. | 0.887   | 0.768  | 0.869  | 1.404 |
|                            | MB4: I believe I will use what I have learned from online tasks in other courses. | 0.865   |        |        |       |
| Goal Orientation            | MB5: I work hard to master new things, for example learning new software. | 0.765   | 0.578  | 0.804  | 1.302 |
|                            | MB6: I want to do well in my courses to show my ability to others (e.g family, friends, etc.) | 0.744   |        | 1.165  |       |
|                            | MB7: If I can, I want to do better than most of my course mates in my online tasks. | 0.772   |        | 1.337  |       |
| Digital Literacy            | TS1: I know most features of my digital device(s). (E.g change wallpaper, adjust camera settings, etc.) | 0.809   | 0.699  | 0.894  | 2.229 |
|                            | TS2: I don’t know how to use my digital device for learning or everyday tasks (e.g installing and uninstalling applications, using social media networking tools, sending and receiving attachments, use of Bluetooth, online software,etc.) | 0.864   |        | 2.055  |       |
|                            | TS3: I can communicate information or ideas effectively to friends using a variety of media or online tools (E.g. WhatsApp, Google Apps, etc) | 0.869   |        | 2.302  |       |
|                            | TS4: I can collaborate online with friends to exchange ideas or generate ideas or generate meaning to complete an online task. | 0.799   |        | 2.361  |       |
| Cognitive Literacy          | CA1: I can search for information from a variety of online sources.    | 0.809   | 0.603  | 0.803  | 1.926 |
|                            | CA2: I can select useful information to complete my digital learning task. | 0.825   |        | 2.072  |       |
|                            | CA3: I can interpret online information that is text-based or non-text based (e.g images, podcasts, videos, maps and models) | 0.798   |        | 2.198  |       |
|                            | CA4: I go online to clarify facts before I solve an online task.      | 0.763   |        | 1.829  |       |
|                            | CA5: I can critically judge the suitability of an online source before copying/retrieving any data. | 0.677   |        | 1.905  |       |
| Socio-Emotional Literacy    | SE1: I use the Internet responsibly for communicating, socialising and learning. | 0.713   | 0.622  | 0.845  | 1.562 |
|                            | SE2: I respect other cultures when I am communicating online.         | 0.744   |        | 1.336  |       |
|                            | SE3: I reveal my certain amount of personal information to safeguard myself | 0.650   |        | 1.699  |       |
|                            | SE4: I understand the potential risks that exist when I am online.    | 0.791   |        | 1.451  |       |
|                            | SE5: I understand copyright rules when I copy or reproduce content from online sources. | 0.708   |        | 1.524  |       |
consistency reliability due to the limitations of Cronbach Alpha. Examples include CA assumes that all indicators be equally related to the construct, CA is less precise because the items are unweighted, and it is also sensitive to the number of items in the construct and tends to underestimate the internal consistency reliability (Hair et al., 2019). The recommended and acceptable composite reliability value is between 0.70 and 0.90 (Hair et al., 2019). The model must also examine for potential collinearity, which is determined by the variance inflation factor (VIF).

According to Hair et al. (2017), there are two generally recognised rules of thumb that may be used to identify major collinearity problems between the indicators of formatively assessed constructs.

1. VIF levels of five or more
2. VIF values greater than or equal to 3.3

All indicators in this study passed the multicollinearity test and consistently fell below the thresholds of 5 and 3.3, as shown in Table 1. Figure 4 illustrates the factor loading which is the correlation coefficient for the variable and factor.

The Fornell and Larcker criteria and the cross-loading criterion are common metrics used to assess discriminant validity. Fornell and Larcker (1981) suggested the latter, in which the AVE of each construct is compared to the squared inter-construct correlations of that construct and all other constructs reflectively evaluated in the structural model. The cross-loading criteria, on the other hand, assesses the indicator loading on the assigned latent variable, where it should be greater than the loadings on all other latent variables (Fornell and Larcker, 1981). According to recent studies, when the indicator loadings on a concept change just slightly, the assessment of cross-loading and the Fornell and Larcker criterion is not acceptable for discriminant validity (Ramayah et al., 2018; Hair et al., 2017). In other words, problems with discriminant validity are not detected by cross-loading assessment or Fornell and Larcker criteria. The Heterotrait-Monotrait Ratio (HTMT), which assures that one construct is really unique from the others, was proposed as a solution to this important problem (Henseler et al., 2015). Subsequently, to assess the extent to which the indicators are empirically different from other constructs, HTMT ratios were employed to evaluate the discriminant validity among indicators (Hair et al., 2019). Table 2 shows the HTMT values obtained and as can be observed, they were all below 0.85 (Kline, 2011) and 0.90 (Gold et al., 2001), indicating that no issue of discriminant validity was found.
4.3. Structural model assessment

After evaluating the measurement model, it was then proceeded with testing the path model for significance which requires the application of bootstrapping routine. Therefore, with a suggested of 5000 bootstrap samples (Hair et al., 2017), the path coefficient assessments are performed and presented in Table 3. The constructs of technological self-efficacy, task-value beliefs, and goal orientation were found to have a t-value ≥ 1.645, with a 0.05 level of significance as presented in Figure 5. However, the path coefficient (β) values showed that the most important predictor is goal orientation (β = 0.258), followed by technological self-efficacy (β = 0.240) and lastly task-value beliefs (β = 0.132). The coefficients of determination (R²) were also evaluated primarily for prediction purposes. In general, R² values of 0.25, 0.50, and 0.73 for target constructs are considered weak, medium, and substantial, respectively (Cohen, 1988). The R² value was 0.534, suggesting that 53.4% of the variance in digital literacy can be explained by the studied constructs. Therefore, from a prediction standpoint, one might consider the model in this study to be parsimonious.

Table 2. Discriminant Validity Evaluation using Heterotrait-Monotrait ratios.

|                           | Cognitive Literacy | Goal orientation | Socio-emotional Literacy | Task-value beliefs | Technical Literacy | Technological Self-efficacy |
|---------------------------|--------------------|------------------|---------------------------|-------------------|-------------------|-----------------------------|
| Cognitive Literacy        |                    |                  |                           |                   |                   |                             |
| Goal orientation          | 0.497              |                  |                           |                   |                   |                             |
| Socio-emotional Literacy  | 0.709              | 0.513            |                           |                   |                   |                             |
| Task-value beliefs        | 0.453              | 0.719            | 0.42                      |                   |                   |                             |
| Technical Literacy        | 0.736              | 0.401            | 0.658                     | 0.33              |                   |                             |
| Technological Self-efficacy| 0.493              | 0.533            | 0.363                     | 0.618             | 0.382             |                             |

Table 3. Hypotheses testing.

| Hypothesis | Std Beta | Std Error | t-value | p-value | Decision |
|------------|----------|-----------|---------|---------|----------|
| H1         | 0.240    | 0.047     | 5.383** | 0.00    | Supported |
| H2         | 0.132    | 0.048     | 2.733** | 0.00    | Supported |
| H3         | 0.258    | 0.04     | 6.232** | 0.00    | Supported |

Note: **p < 0.05

5. Discussion

5.1. Theoretical and pedagogical implications

This study examined the relationship between motivational belief strategies and digital literacy in digital learning among university students. It also examined the structural relationships between perceived technological self-efficacy, task-value beliefs, and goal orientation towards promoting the enhancement of digital literacy competency to transform university students to become smart online learners who are capable of participating effectively, ethically, and responsibly in using technology and digital tools. Results from this study showed that technological self-efficacy was the second most significant construct with a t-value of 5.135, which supported H1. This finding is in line with the literature which postulates that highly self-efficacious students are more courageous in trying out anything, and put forth more effort, persistence, and perseverance in accomplishing tasks in digital learning. The displays of the right digital attitude can enhance digital literacy competency (Prior et al., 2016; Shopova, 2014). As such, high self-efficacy students are less likely to experience digital learning failures. For example, students with high technology self-efficacy tend to persist in their learning or completion of tasks even in the face of failure. Highly efficacious students might use failure as an opportunity to seek feedback, and help, and subsequently improve digital literacy competency (Pintrich, 2003). Therefore, this finding is of great importance for educators to encourage students to be self-efficacious by instilling several strategies. One way to be more self-efficacious is to condition the mind through self-talk and self-encouragement. Academics can play a role in helping create optimal conditions to foster self-motivation. Academics play an important role in guiding students to acquire and develop these self-motivation skills for learning. Academics should not merely focus on teaching and delivering information and knowledge to students, instead, they can create a meaningful alignment of student interest with an assignment or other...
learning opportunity. This might spark motivation among students. Once the habit is acquired, this will help students to actively think about learning and work towards improving the strategies they use to learn. Students need to have the ability to choose the right motivation strategies to master knowledge, learn new skills, and monitor their learning progress. Apart from that, academics can foster students’ interest by providing positive feedback to retain interest and motivation and selecting resources that promote interest.

The study also found support for the notion of task-value beliefs promote digital literacy. This study revealed a significant, positive link between task-value beliefs and digital literacy with a t-value of 2.744. Thus, H2 was supported. The findings of this study echoed the findings from past literature where it reported a positive relationship between motivational belief strategies and digital literacy (Janssen et al., 2013; Greene et al., 2014). Although students need to understand the importance of the task at hand, this relationship is seen to be the least significant. This is probably because students approach tasks differently due to cognitive processing ability and cultural differences, among others. Therefore, to optimally implement task values strategies in a digital learning context, it is suggested that academics do the following:

- Define task value – Defining a task value is being able to link with future values. Thus, academics need to be able to determine an interesting, engaging, relevant, or important assignment, and then share those reasons with the students. Defining task value at the beginning of an assignment would indirectly boost students’ confidence in their ability to perform their academic tasks because they have the right mindset. The basic goal of displaying passion is to get students to care about the topic or activity, not to entertain, entertain, or excite them (Brody, 1998, p. 173). Task value must be measurable and clear.
- Assign task values - Academics may assign task values to the assignment learning outcomes to assist students in understanding the task value so that student interest can be retained. Academics may provide an enriching environment for students by allowing them to pursue their passions. Academics, for example, can create enrichment projects based on the interests of students. By giving students tasks that have meaning and integrity in their own right, students experience a sense of accomplishment when they do a complete job from beginning to end. Students may also be allowed to engage in projects that have large scale ramifications or implications (i.e., creating a new invention, helping someone in need).
- Check the task values - Once students complete their assignment, providing the students with a check list before submission can ensure the clarity of task values, particularly concerning assignment requirements. This can improve the communication delivery of task values among students as motivated students would continuously engage in self-regulatory activities to reach a goal.

Findings from this study revealed that goal orientation strategies were the most significant with a t-value of 6.417, thus supporting H3. Goal orientation strategies are based on mastery, extrinsic, and relative ability orientation which is indeed vital in acquiring digital literacy. One of the possible reasons for this could be attributed to the existence of a competitive spirit among university students where they tend to compete with each other when it comes to learning. This result is consistent with several scholarly pieces of research where goal orientation strategies are instrumental in elevating digital literacy (Shopova, 2014; Janssen et al., 2013; Greene et al., 2014; Yang et al., 2014). This finding may be useful for academics to incorporate more game-based pedagogy in the classroom to motivate students to perform better. This will also indirectly support more self-directed learning, where game-based learning activities can increase students’ goal orientation towards achieving a learning objective. Game-based pedagogy can provide competitive indicators of progress that can create social pressure to increase students’ engagement and consequently have a constructive effect on participation and learning (Sailer et al., 2017). Incorporating elements of fantasy or game-like elements such as challenges, fiction and/or fantasy, obstacles to overcome, and secret information, among others into classroom exercises (Brophy and Alleman, 1998) can encourage students in ways that enable them to engage in learning activities in a playful manner. Learning activities, on the other hand, must not detract from the targeted goals. Academics should also be able to discriminate between enjoyable activities that require learning and those that are merely enjoyable. Therefore, in this game-based environment, academics can encourage and foster healthy competition among students. Students who feel involved in their learning progression will feel motivated to perform digital tasks better, have a better “learning experience, and thus elevate digital literacy competency.

5.2. Limitation of study and future research direction

Despite the significance reported for the hypothesized relationships, this study has limitations that need to be addressed in future research investigations. This study employed a cross-sectional survey design that sought students’ perceptions of their motivational strategies and digital literacy competency. As a result, the respondent’s response is significantly influenced by their attitude, emotion, and experience at the time of data collection. Therefore, the data accuracy might be affected because students’ perceptions could be underrepresented and overrepresented. Longitudinal studies should cover this limitation to know the true perception of motivational strategies and digital literacy competency. Secondly, the population of students studied in this study comprised IT students, who are assumed to have high level skills in technology. Thus, this might have skewed the findings in the aspect of motivational beliefs. Future studies could include students from other educational disciplines and use a combination of different research methods to verify the results. Additionally, this study could also explore a comparison between perceived and actual motivational strategies and digital literacy in educational technology for future investigation.

6. Conclusion

Overall, the role of motivational belief strategies is inevitable in fostering digital literacy enhancement as it may contribute to the more efficient and critical use of digital tools. The study used digital literacy and self-determination theory to understand the use of motivational belief strategies in elevating students’ digital literacy competency in digital learning. Theoretically, this study provided greater insight and understanding of the use of motivational belief strategies and their impact on digital literacy. Based on the findings of the study, it is duly noted that motivation plays a huge role in students’ learning progress and subsequently, digital literacy competency among students. The role of motivational belief strategies is indispensable in digital learning; it is the driving force of achievement as it could contribute to the more efficient and judicious use of digital tools. Digital literacy is now a part of the fundamentals of survival in this new digitally connected world, and students need to be prepared for the inevitable when technology will be so integral to society. With the availability of technology and digital tools, motivational belief strategies are needed to enhance digital literacy as well as to prepare students to be a part of the digital future. When students are motivated, they develop skills and competencies and can complete tasks with minimal difficulties. A key factor in motivation is the mindset. A motivated mindset can sustain and activate positive behaviour in digital learning.

Declarations

Author contribution statement

Lilian Anthonymsamy: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.
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