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Motivation is key: exploring the role of motivation on learning approaches

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ABSTRACT

This study explored the relationship between motivation and learning approaches among university students. A total of 182 students participated in an online survey, which included the Revised Study Process Questionnaire (R-SPQ-2F), the Academic Motivation Scale (AMS), and the Assessment Preference Inventory (API). Multiple regression analysis revealed that intrinsic motivation factors (motivation to know, accomplish, and experience stimulation) were significant predictors of a deep approach to learning. Identified regulation also positively influenced this approach, while extrinsic motivation had no significant effect on deep learning strategies. High extrinsically motivated individuals were more likely to use a surface learning approach. Pearson's r correlations showed that deep learners preferred assessments involving critical thinking, while surface learners favored assessments requiring recall. Limitations included a gender imbalance and potential social desirability bias. Future research should explore the influence of ethnicity and environmental factors on motivation and learning approaches.

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Intrinsic and extrinsic motivation; deep and surface learning; academic achievement; amotivation

Introduction

Learning approaches

Understanding the learning approaches students take when it comes to their educational journey is important. Reynolds (1997) challenges the validity of learning styles, particularly within the context of management development, by proposing the concept of learning strategy as a more effective alternative. They critique the traditional notion of learning styles for its lack of contextual sensitivity, arguing that its widespread and decontextualised application can inadvertently perpetuate discriminatory practices based on gender or race. By emphasising learning strategies, Reynolds advocates for a more individualised and contextually aware approach to learning, which takes into account the diverse backgrounds and experiences of learners. This perspective not only questions the efficacy of learning styles but also highlights the potential for bias and

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inequality that can arise from their uncritical adoption. The authors agree with an individualised approach to learning and for the purpose of this study, thus for this study have chosen to investigate the different learning approaches of the participants. The deep and surface learning approaches (J. Biggs, 1993; J. B. Biggs, 1987; Marton & Säljö, 1976; Ramsden & Entwistle, 1981, 1982) were introduced to understand how people approach learning, named SAL (Student Approaches to Learning) (Marton & Sajlo, 1976). The SAL framework (J. B. Biggs, 1987; Marton & Säljö, 1976) enables us to discern two distinctive approaches to learning: reproducing contents versus an inner desire to make sense of one's own learning (Harackiewicz et al., 2014). This framework defines two key approaches to learning: deep learning approach and surface learning approach. A surface approach to learning is characterised by memorising parts of the content of the learning materials without questioning them, concentrating on memorising instead of understanding (rote learning) and being more influenced by assessment requirements (Winje & Løndal, 2020). This is often characterised by preoccupation with unreflective strategies (Spada & Moneta, 2012; Trigwell et al., 1999). In contrast, the deep learning approach is the type of learning where an individual goes through each point in the information provided rather than skimming through the information (as one would do using a surface approach) (Draper & Waldman, 2013). According to research by Beattie et al. (1997), deep approach learning is used by individuals who aim to seek the meaning of the teaching materials, relate their ideas to previous knowledge and experiences, understand the logic of the arguments, and relate the evidence presented to the conclusions. Therefore, the deep approach refers to the intention of students to understand information by relating ideas to each other and using evidence to support them (Lindblom-Ylänne et al., 2018). Students' preference for a learning approach can depend on several contextual variables. Smarandache et al. (2022) investigated interactions between the elements that define students' learning preferences. Their results (from a large sample of 5,357 students) showed that the interest-to-effort ratio is central to students' preference for deep or surface learning. This means that interesting materials that are invested with extra time are also understood in a deep manner, while uninteresting materials involve little effort and time, and are associated with surface learning. A recent study by Hands and Limniou (2023) added metacognition to the mix of deep and surface learning approaches. They found that both metacognition and learning approaches showed medium correlations and an effect of the year of study. Their results suggest that students will lean towards more surface learning as their (perceived) workload increases and assessments become more challenging.

Motivation

In addition to learning approaches, determining underlying motivational factors' impact on task completion is a complex yet pivotal concept to understand how to maximise performance. Intrinsic and extrinsic motivational approaches to learning have been an increasingly central topic of investigation, especially in the education sector (Ryan & Deci, 2020). According to the Higher Education Statistics Agency (HESA), the education sector is one of the fastest growing sectors in the UK (Preece & Purvis, 2017) which makes it even more important to explore how students attain information and what motivates them. Motivation and approach to learning are key determinants of students'

academic success and learning outcomes. Motivating the learner to learn is pertinent to curriculum implementation. This is because motivation is an influential factor in the efficacy of learning and teaching (Filgona et al., 2020). It is the force that encourages an individual to face and overcome tough and challenging circumstances (Gopalan et al., 2017). A student's encouragement for learning can be affected by a variety of correlated factors which may consist of features of the curriculum, teacher, learner, educational environment, learning activities and other environmental factors (Kaveh, 2010). Intrinsic motivation is the motivation that comes from one's own self whereas extrinsic motivation comes from external factors (Ryan & Deci, 2000). In educational psychology, intrinsic motivation, stemming from internal drives such as interest, is associated with deep approach to learning. Students with a deep approach to learning tend to use an integrative approach as well as using self-evaluation techniques to complete tasks through a reflective approach (Bächtold et al., 2022), which relies on this intrinsic drive. Extrinsic motivation uses operant conditioning principles, by using factors to increase/decrease the frequency of behaviours (Ryan & Deci, 2000). It encourages individuals to complete a task by focusing on the outcome, such as grades, instead of the process (Xu et al., 2021). It is driven by external rewards or pressures and is mainly associated with surface approach to learning, where students use a fragmented approach to performing tasks that is non-reflective (Lindbolm-Ylänne et al, 2019). Intrinsic motivation helps develop an internal drive to engage in activities based on an individual's goals and values (Deci & Ryan, 2008). Studies have been conducted to observe the effects of intrinsic motivation on student learning (Cordova & Lepper, 1996; DePasque & Tricomi, 2015; Tokan & Imakulata, 2019). It has been shown that learners who are exposed to motivationally-enriched activities have higher levels of intrinsic motivation compared to those who do not (Martens et al., 2004). Martens et al. (2004) investigated what students actually do in an online learning environment. It was found that students with high intrinsic motivation do not tend to work harder in the same amount of fixed time, rather they tend to do things differently. The increased curiosity of students with high intrinsic motivation results in significantly more explorative study behaviour. Additional research by Liu et al. (2012) supports the proposition that motivation has an important and consistent positive relationship with examination scores. Manipulation of motivation could significantly enhance a student's motivation in taking low-stake assessments, which can in turn increase their test scores on other forms of tasks (Multiple Choice Questions and essays).

Self determination theory

Self Determination Theory (SDT) is a psychological framework that was developed to understand human motivation (Ryan & Deci, 2000). According to SDT, individuals may internalise the extrinsic reasons for engaging in an activity and associate a sense of volition with them. The more extrinsic reasons are internalised, the more individuals are self-determined in their behaviours, that is, motivated to undertake these behaviours (Bächtold et al., 2022). Knowing how distinct encouragements can impact the quality and efficiency of task completion can be valuable in multiple sectors of life. Intrinsic values are defined as doing a task based on the mere enjoyment of the activity whereas extrinsic values lean towards

executing a task based on possible rewards for oneself (Ryan & Deci, 2000). Examples where task completion may be impacted include leaders' possible incentive systems for employees, students' approach to learning as well as societies' outlook on simple everyday tasks. In an educational setting, individuals with a higher intrinsic motivation tend to perform better at online learning than people with low intrinsic motivation (Martens et al., 2004), possibly due to the intrinsic drive to continue through periods of obstacles, and the use of a deep learning approach.

Metacognition

Learning strategies like metacognition awareness can help students improve their academic achievement. Metacognitive strategies consist of planning, monitoring and regulating one's behaviour, which assists students in managing and executing their learning. Deep cognitive and metacognitive strategies had a positive relationship with performance-approach goals (Vrugt & Oort, 2008). Assessments that require critical thinking, analysis, and application of knowledge are associated with deep approaches to learning. Conversely, assessments that require memorisation or recall may be more closely associated with a surface approach to learning. Research concerning the effects of intrinsic motivation on performance is somewhat mixed. Some studies show that students with high intrinsic motivation do not outperform their peers academically. Rather, high intrinsic motivation is only related to more exploratory behaviour combined with curiosity (Martens et al., 2004). On the other hand, other strategies like developing a sense of autonomy in tasks may improve intrinsic motivation and therefore may lead individuals to feel more involved in tasks. Making them decide on certain options may increase intrinsic motivation and therefore increase task performance or task exploration (Schatz, 2023). As discussed above, research has looked at the link between motivation and academic performance, however, there is a gap in the literature about the relationship between motivation, approach to learning and how that links to preferences for different assessment types. Therefore, the aim of this study is to investigate whether motivation is linked to learning approaches and assessment preferences. This leads to the following hypotheses:

(1) High intrinsic motivated learners would be significantly more likely to have deep approach to learning.
(2) High extrinsic motivated learners would be significantly more likely to have surface approach to learning.
(3) Learners with a high score for the deep approach to learning correlate with preference for assessments that are more critical.
(4) Learners with a high score for the surface approach to learning correlate with preference for assessments that are more recall-like.

Methods

Participants

A total of 185 participants started the survey but only 182 were students; most identified as female (131; 72.0%), 50 (27.5%) identified as male, and one preferred not to say (0.5%). Participants were between 18 and 49 years of age, with a mean age of 20.5 years ($SD = 3.1$ years). Sixty-two (34.1%) participants were registered in Framework for Higher Education Qualifications (FHEQ) Level 4/Year 1, 88 (48.3%) in FHEQ Level 5/Year 2, 27 (14.8%) in FHEQ Level 6/Year 3, 2 (1.1%) in FHEQ Level 7/Postgraduate taught, 1 (0.5%) in Other, and 2 (1.1%) preferred not to say. In terms of ethnicity, 78 (42.9%) identified as Asian, 45 (24.7%) as White, 28 (15.4%) as Black, 14 (7.7%) as Other, 10 (5.5%) as Mixed, 5 (2.7%) as prefer not to say and 2 (1.1%) as Chinese. Most FHEQ Level 4/Year 1 and FHEQ Level 5/Year 2 students were recruited through the Psychology Participant Pool System (SONA), as part of their Research Methods and Statistics modules, and received credits in recompense for their participation (2 credits). The other students who took part were recruited via social media and word of mouth. Data collection took place between 6 January 2023 and 10 March 2023.

Survey materials

The survey consisted of five sections. The first section asked demographic questions. These included: their level of study, their subject of study, their age, their sex and their ethnicity.

Revised Study Process Questionnaire (R-SPQ-2F)

The second section was the R-SPQ-2F (J. Biggs et al., 2001). The R-SPQ-2F is a measure to evaluate the learning approaches of students. Participants responded to 20 statements relating to the way they usually study and rated each statement on a 5-point Likert scale from 1 "this item is never or only rarely true of me" to 5 "this item is always or almost always true of me". Example items include *"I find that at times studying gives me a feeling of deep personal satisfaction", "My aim is to pass the course while doing as little work as possible"*. The questionnaire can be used to derive four subscales (Deep Motive, Deep Strategy, Surface Motive, Surface Strategy) or collapse to two factors (Deep Approach, Surface Approach). No item was reverse-coded. The reliability of the Deep Approach factor was $\alpha = .84$ and the Surface Approach was $\alpha = .82$. A higher Deep Approach score indicates that students take a more in-depth approach to learning. A higher Surface Approach suggests students only do what is necessary to complete their studies.

Academic Motivation Scale (AMS)

The third section was the AMS (Vallerand et al., 1989). The AMS consisted of 28 items measuring three types of motivation in seven subscales. Intrinsic motivation refers to pursuit of behaviour due to its inherent interest or enjoyment and is measured with "to know", "to accomplish things" and "to experience stimulation" subscales. Extrinsic motivation refers to behaviours that are pursued to accomplish a goal or purpose, measured with "external regulation" (external contingencies regulate the behaviour), "introjected regulation" (external contingencies are internalised as rules that motivate

behaviours) and "identified regulation" (behaviours pursued due to being perceived as valuable) subscales. Amotivation refers to an absence of motivation due to a lack of contingencies between action and outcome. Participants were required to rate each item based on how much each statement corresponds to why they attend university on a scale from 1 "does not correspond at all" to 5 "corresponds exactly". Example statements include "*Because I experience pleasure and satisfaction while learning new things*", "*Because I think a university education will help me better prepare for the career I have chosen*", "*Honestly, I don't know. I really feel that I'm wasting my time in university*". Reliability for the intrinsic motivation-to know subscale was α = .85, for the intrinsic motivation-to accomplish things was α = .86, for the intrinsic motivation-to experience stimulation subscale was α = .85, for the extrinsic motivation-external regulation subscale was α = .81, for the extrinsic motivation- introjected motivation subscale was α = .79, for the extrinsic motivation-identified regulation subscale was α = .84, and the amotivation subscale was α = .89. No reverse-coding was needed. A sum score was calculated for each of the seven subscales. A higher score indicated greater motivation of that type.

Open Questions

The fourth section included two open questions to help us understand the quantitative data at a more in-depth level. These were: *"What do you feel is your main source of motivation to learn as a university student?"* and *"How does your motivation influence your level of engagement in your studies?"*.

Assessment Preference Inventory (API)

The fifth section was the API (Birenbaum, 1994). The API consists of 66 items. Participants were asked to indicate to what extent they would like their assessments to be based on each of the first 36 items, followed by 30 items where they indicated their preference on the role of the instructor in relation to the assessments. They rated each item on a scale from 1 (not at all) to 5 (to a great extent) or 0 (N/A). Example items are *"Written tests, with supporting materials (notes, books)"* and *"To what extent would you like the instructor to: hand out at the beginning of the course, a detailed description of the way your achievements will be assessed"*.

Data analysis strategy

The survey data was analysed using IBM SPSS Statistics version 28 (IBM Corp, 2021). There were no missing values and data were checked for normality using skewness (all values < 1.09) and kurtosis (all values < .89) values. Multiple linear regression was conducted for each outcome variable of hypotheses 1 and 2. Pearson correlations were conducted to test hypotheses 3 and 4. An alpha level of 0.05 was used for all statistical tests.

Procedure and ethical considerations

Data was collected via online survey using JISC (https://www.onlinesurveys.ac.uk/). Ethics approval to conduct the study was given by the authors' institution Research Ethics Committee (Ref: 40510-MHR-Dec/2022–42678–2). Participants were presented

with a participant information sheet and an informed consent form, after which they gave their consent and started the study. Participants were informed that their data would be confidential and that they could withdraw their participation at any point, should they wish, and that no penalty would be applied. At the end of the study, participants were thanked for their participation, received a debrief form, and the relevant amount of participation credits.

Results

The authors acknowledge that the outcome variables used in this study are ordinal in nature. While these variables were treated as continuous to facilitate the use of multiple linear regression analysis, this approach is not without debate. Some scholars argue that ordinal variables are better analysed using ANOVAs or non-parametric tests. However, others suggest that treating ordinal variables as continuous can be acceptable, particularly when they have a sufficient number of levels and meet the assumptions of regression (Winship & Mare, 1984). The choice of multiple linear regression in this study was guided by the need to model the relationships between predictors and outcomes. The authors believe this approach provides a more nuanced understanding of the data. Before conducting the multiple linear regressions to test hypotheses 1 and 2, the correlations between the variables were calculated and are presented in Tables 1 and 2.

As shown in Tables 1 and 2, some of the variables were significantly correlated. However, assumptions of conducting a multiple linear regression were checked and met, see below, so these correlations are of no concern. Two multiple linear regressions were used to assess how the different types of motivation: intrinsic motivation to know, to accomplish things, to experience stimulation), extrinsic motivation (external regulation, introjected regulation, identified regulation), and amotivation predict each of the two approaches to learning (deep approach and surface approach) (testing hypotheses 1 and 2). To ensure the appropriateness of the linear regression analysis, the assumptions of linearity, normality, and absence of auto-correlation were examined and no violations were detected. Specifically, the Durbin-Watson statistic was used to test for auto-correlation. The statistic was 1.89 for deep approach to learning and 1.84 for surface approach to learning. As all values are between 1.5 and 2.5 (Field, 2013), the data are not auto-correlated. The Variance Inflation Factor values were between 1.47 and 3.60 (i.e., below the threshold of 10), and the tolerance values between .28 and .68, thus the data does not show any multicollinearity in the predictor variables (Field, 2013).

For deep approach to learning, results indicate that the model is statistically significant ($F(7,174) = 30.14$, $p < .001$) and explained 53.0% of the variance in the data (adjusted $R^2 = .53$). From the predictor variables (Table 3), all predictors were significant except for extrinsic motivation (external regulation).

For surface approach to learning, results indicate that the model is statistically significant ($F(7,174) = 12.84$, $p < .001$) and explained 31.4% of the variance in the data (adjusted $R^2 = .31$). From the predictor variables (Table 4), extrinsic motivation (external regulation) and amotivation are significant. No other predictors are significant.

To test hypotheses 3 and 4, Pearson's r correlations were conducted between each of the assessment preference items and the participants' scores on deep and surface approach learning (Table 5). The column "Expectation" shows whether we expected

Table 1. Correlation coefficients for deep approach to learning.

Pearson correlation, all *N* = 182	Deep approach	Intrinsic motivation – to know	Intrinsic motivation – towards accomplishment	Intrinsic motivation – to experience stimulation	Extrinsic motivation – identified	Extrinsic motivation – introjected	Extrinsic motivation – external regulation	Amotivation
Deep approach	1.000	.673	.530	.627	.373	.245	.169	−.064
Intrinsic motivation – to know	.673	1.000	.695	.698	.538	.476	.277	−.335
Intrinsic motivation – towards accomplishment	.530	.695	1.000	.575	.419	.648	.265	−.283
Intrinsic motivation – to experience stimulation	.627	.698	.575	1.000	.235	.289	.103	.012
Extrinsic motivation – identified	.373	.538	.419	.235	1.000	.470	.708	−.369
Extrinsic motivation – introjected	.245	.476	.648	.289	.470	1.000	.472	−.136
Extrinsic motivation – external regulation	.169	.277	.265	.103	.708	.472	1.000	−.106
Amotivation	−.064	−.335	−.283	.012	−.369	−.136	−.106	1.000

Table 2. Correlation coefficients for surface approach to learning.

Pearson correlation, all *N* = 182	Surface approach	Intrinsic motivation – to know	Intrinsic motivation – towards accomplishment	Intrinsic motivation – to experience stimulation	Extrinsic motivation – identified	Extrinsic motivation – introjected	Extrinsic motivation – external regulation	Amotivation
Surface approach	1.000	−.121	.015	−.032	.001	.152	.263	.457
Intrinsic motivation – to know	−.121	1.000	.695	.698	.538	.476	.277	−.335
Intrinsic motivation – towards accomplishment	.015	.695	1.000	.575	.419	.648	.265	−.283
Intrinsic motivation – to experience stimulation	−.032	.698	.575	1.000	.235	.289	.103	.012
Extrinsic motivation – identified	.001	.538	.419	.235	1.000	.470	.708	−.369
Extrinsic motivation – introjected	.152	.476	.648	.289	.470	1.000	.472	−.136
Extrinsic motivation – external regulation	.263	.277	.265	.103	.708	.472	1.000	−.106
Amotivation	.457	−.335	−.283	.012	−.369	−.136	−.106	1.000

Table 3. Model coefficients for deep approach to learning, * indicates $p < .05$ and **$p < .001$.

				95.0% CI	
Model	β	t	p	Lower Bound	Upper Bound
(Constant)		3.56	<.001	3.71	12.92
Intrinsic motivation (to know)**	.44	4.60	<.001	.48	1.21
Intrinsic motivation (to accomplish things)*	.23	2.59	.010	.10	.74
Intrinsic motivation (to experience stimulation)*	.21	2.54	.012	.08	.66
Extrinsic motivation (identified regulation)*	.20	2.25	.025	.05	.75
Extrinsic motivation (introjected regulation)*	−.22	−2.86	.005	−.73	−.13
Extrinsic motivation (external regulation)	−.06	−.71	.478	−.41	.19
Amotivation*	.19	3.00	.003	.11	.53

Table 4. Model coefficients for surface approach to learning, ** indicates $p < .001$.

				95.0% CI	
Model	β	t	p	Lower Bound	Upper Bound
(Constant)		3.71	<.001	5.07	16.58
Intrinsic motivation (to know)	−.06	−.50	.617	−.57	.34
Intrinsic motivation (to accomplish things)	.20	1.88	.062	−.02	.78
Intrinsic motivation (to experience stimulation)	−.14	−1.40	.164	−.61	.11
Extrinsic motivation (identified regulation)	−.09	−.88	.381	−.63	.24
Extrinsic motivation (introjected regulation)	.04	.48	.635	−.28	.46
Extrinsic motivation (external regulation)**	.34	3.60	<.001	.31	1.07
Amotivation**	.50	6.75	<.001	.63	1.15

this type of assessment to be more in line with deep approach learners, surface approach learners, both type of learners or we had no expectation.

The two open questions were analysed by summarising the responses students provided. Results showed that to the first question: *"What do you feel is your main source of motivation to learn as a university student?"*, responses could be categorised in approximately eight themes reflecting their key motivations for pursuing education. First, students mentioned career aspirations. Many responses highlight the desire to secure a good job, advance in a specific career field, achieve job security, or earn a high salary. For these participants, university is seen as a stepping stone to these goals. Second, there is an element of personal growth and accomplishment: several participants emphasised self-improvement, gaining knowledge, academic validation, and the sense of pride and accomplishment from earning a degree. Third, financial stability was raised. A recurring motivation is the prospect of a financially stable future, avoiding struggles, and justifying the high cost of education. Fourth, family and social expectations. Students were driven by the desire to make their parents proud, support their future family, or meet societal expectations. Fear of failure or guilt about the financial investment in education also plays a role. Fifth, an interest in learning which is reflected in a genuine curiosity about the subject matter and passion for their field of study motivates many students to continue their education. Sixth, a fear of failure was raised. Some responses mentioned the fear of failing academically, professionally, or personally, which drives them to persevere. Seventh, future prospects and discipline. Students expressed motivation rooted in the hope for a better future, a structured and disciplined approach to life, and preparation for long-term success. Finally, other external influences were also mentioned. Friends, lecturers, and comparisons with peers also inspire some students to stay focused and motivated.

Table 5. Pearson's r correlations between assessment preferences and approaches to learning, * indicates $p < .05$ and ** $p < .001$.

Item	Deep approach		Surface approach	Expectation	Outcome	
$N = 182$	*r*	*p*	*r*	*p*		
1. Written tests, with supporting materials (notes, books).	.145	.051	.124	.096	Either	Not met
2. Written tests, without the use of supporting materials.	.182	.014*	.122	.100	Either	Partially met
3. Written tests without a time limit, with supporting materials.	.084	.259	.064	.392	Either	Not met
4. Written tests without a time limit and without supporting materials.	.141	.058	.146	.049*	Either	Partially met
5. Individual oral tests, without supporting materials.	.170	.022*	.137	.065	Deep	Met
6. Individual oral tests wherein the questions are given half an hour prior to the test, without supporting materials.	.144	.053	.178	.016*	Deep	Against prediction
7. Individual oral tests wherein the questions are given half an hour prior to the test, with supporting materials.	.070	.349	.113	.128	Either	Not met
8. Oral tests, in the form of a group discussion where the instructor observes and assesses the contribution of each of the participants.	.104	.164	.034	.652	Either	Not met
9. Take-home exams.	−.041	.587	−.002	.983	Either	Not met
10. Papers/projects.	.039	.598	−.110	.139	Either	Not met
11. Portfolio (your collected work, finished and in progress).	.211	.004*	−.061	.410	Deep	Met
12. Computerised tests.	.251	<.001**	.074	.322	Either	Partially met
13. Multiple-choice questions.	−.001	.988	−.081	.276	Surface	Not met
14. Concept maps (charts expressing relations between concepts learned).	.175	.018*	.002	.984	Deep	Met
15. Open-ended questions requiring short answers.	.077	.301	−.013	.865	Either	Not met
16. Open-ended questions requiring long answers (essays).	.118	.112	.040	.588	Either	Not met
17. Tasks resembling as closely as possible tasks encountered during lectures or in text books.	.197	.008*	−.073	.330	Surface	Against prediction
18. Performance tasks resembling as closely as possible those performed by a qualified person in the profession for which you are preparing yourself.	.112	.133	−.155	.037*	Deep	Against prediction
19. Tasks related to real-life situations/events.	.073	.328	−.101	.175	Deep	Not met
20. Simple tasks having only one correct answer.	.105	.158	.102	.171	Surface	Not met
21. Complex and challenging tasks having more than one possible answer.	.253	<.001**	.046	.538	Deep	Met
22. Detailed tasks, in which each stage is defined by the instructor.	.240	.001*	.122	.100	Either	Partially met
23. Knowledge questions related to the reading assignments.	.284	<.001**	−.081	.277	Surface	Against prediction
24. Comprehension questions related to the material taught by the instructor.	.199	.007*	.040	.595	Surface	Against prediction
25. Questions requiring the application of material learnt during the course to new situations.	.291	<.001**	−.068	.365	Deep	Met
26. Questions that require the providing of examples.	.343	<.001**	−.059	.426	Deep	Met
27. Questions that require comparing different concepts/ideas.	.231	.002*	.051	.494	Deep	Met
28. Questions that require data analysis and interpretation.	.318	<.001**	−.016	.834	Deep	Met
29. Questions that require drawing conclusions.	.237	.001*	.040	.588	Deep	Met
30. Questions that require an overall view of the relations among all topics learnt.	.308	<.001**	.020	.794	Deep	Met
31. Questions that require creativity and imagination.	.170	.022*	.140	.059	Deep	Met
32. Questions that require a personal explanation or opinion.	.156	.035*	.039	.604	Either	Partially met
33. Questions that require critical thinking.	.176	.017*	.033	.662	Deep	Met
34. Questions in which you are asked to evaluate others' solutions or opinions.	.137	.064	.123	.097	Deep	Not met
35. Questions that require scientific investigation.	.309	<.001**	−.004	.959	Deep	Met
36. Questions that require problem solving.	.257	<.001**	.030	.690	Deep	Met

To the second question, "*How does your motivation influence your level of engagement in your studies?*", the following themes were identified by summarising the responses. Motivation seems to severely impacts students' engagement in their studies, often serving as a driving force behind focus, effort, and productivity. Many students highlight a positive link between motivation and engagement, noting that higher motivation leads to increased concentration, participation in lectures, and completion of tasks. Family pressure, personal goals, and the desire for a professional career are common sources of motivation as also came up in the other open question. However, fluctuations in motivation – often caused by burnout, mental health challenges, or lack of interest – can lead to decreased engagement. Some students emphasised that discipline plays a more critical role than motivation, as it ensures consistency even when motivation is low. Other participants pointed out that external factors, such as family expectations or the relevance of topics, can either enhance or hinder their motivation to engage. Overall, motivation is described as essential but inconsistent, requiring supplementary strategies like goal-setting and reminders of long-term aspirations to sustain engagement.

Discussion

The aim of this study was to investigate the relationship between motivation, approaches to students' learning, and assessment type preferences. The hypotheses of the study were that high intrinsic motivated learners would have higher deep learning approach; high extrinsic motivated learners would have higher surface learning approach; individuals with high deep score would prefer assessments with more critical thinking; and individuals with high surface score would prefer assessments that involve recollection of information learnt.

The results of the linear regression analysis examining the deep approach to learning indicate a significant relationship between type of motivation and learning strategies. Notably, intrinsic motivation factors, including motivation to know, accomplish things and experience simulation emerged as significant predictors of deep approach to learning. This shows the importance of internal drive in promoting students' engagement and learning outcomes. This is consistent with SDT (Deci & Ryan, 1985), which states that intrinsically-motivated behaviours stem from inherent psychological needs for autonomy and competence. Our results are consistent with this framework, as students with higher intrinsic motivation showed more propensity for deep learning approaches and a preference for assessments that allowed them more scope for autonomy, such as portfolios and concept maps (Deci & Ryan, 2008). The responses to the open questions show a varied mix of how intrinsic and extrinsic motivation play a role in students' level of engagement and approaches to learning. These range from the drive for financial stability and a good job to genuine curiosity and self-development.

Additionally, identified regulation, representing internally-regulated behaviours aligned with personal values and goals, positively influenced the deep approach to learning. This significant impact of identified regulation suggests that autonomous forms of motivation are conducive to adapting learning outcomes (Cho et al., 2021). In the study conducted by Cho et al. (2021), they concluded that students with high motivation showed higher levels of self-regulation between student and content and self-regulation between student and instructor than those with average and low

motivation. Students with high motivation seemed to control their learning more actively and independently by setting goals, managing learning tasks, and monitoring and evaluating the process of learning tasks. The absence of significant findings for extrinsic motivation in our study suggests that externally-imposed rewards or pressures may not effectively promote deep learning approaches among students. Extrinsic incentives are more likely to simulate a surface approach, learning by memorisation, which supports the critiques of the use of extrinsic motivators in educational contexts (Deci et al., 2017). A study by Pillay (2007) found that students were motivated by ambition, application of knowledge, passing assessments, and workload. The study also found that intrinsic motivation led students to adopt a deep learning approach while extrinsic motivation led them to a surface learning approach.

People with high extrinsic motivation tend to use the surface learning approach. The results of our study were consistent with this, confirming our hypothesis. A study conducted by Prat-Sala and Redford (2010) aimed to examine the interrelationships between motivation orientation (intrinsic and extrinsic motivation), self-efficacy, and approaches to learning (deep and surface learning). They concluded that students adopting the surface approach are more likely to prefer non-challenging tasks. Learners who deploy a surface learning approach tend to resort to a repetitive strategy; memorising facts and accurately reproducing them without deeper engagement with the content (Everaert et al., 2017). The results of a study conducted by Everaert et al. (2017) indicated that male students adopted a significantly higher level of surface learning. According to Kember (1995), the reason why male students are more likely to adopt surface learning is due to higher work pressure and family commitments.

Deep learning involves the critical analysis of new ideas, linking them to concepts and principles that are already known, and leads to understanding and long-term retention of concepts so that they can be used for solving future unfamiliar problems (Kumar et al., 2011). It positively correlates with critical thinking (Beşoluk et al., 2010). Deep learners tend to favour essay-type and oral examinations as well as final dissertations (Furnham et al., 2008). In accordance with this, one of the hypotheses of this study was that individuals who tend to use deep learning approaches would prefer critical thinking assessments. Our results confirmed this hypothesis, with the deep learning approach correlating with preference for assessments such as portfolios, concept maps, and complex and challenging tasks with more than one possible answer. A study conducted by Doğan et al. (2012) had concluded that students who use the deep learning approach have a tendency to prefer complex-constructivist assessment. They claim that educators who use complex-constructivist type of assessmentscreate an atmosphere for their students to apply deep learning approaches. Educators should use methods that aim to assess higher-order thinking skills because the modern world requires people who can apply deep learning approaches to be successful in life (Doğan et al., 2012).

Surface learning approach is the acceptance of information and memorisation of isolated and unlinked facts (Kumar et al., 2011). Educators who use assessment methods that aim to assess lower-order thinking skills lead students to apply the surface learning approach (Doğan et al., 2012). It leads to superficial retention of material for examinations and does not promote understanding or long-term retention of knowledge and information (Kumar et al., 2011). The last of our hypotheses was that learners who adopt a surface learning approach tend to prefer assessments

based on this more superficial recall. In accordance with this, our results showed that surface learners tended to prefer Multiple Choice Questions (MCQs) and group work assignments while they tended to view essay-type and dissertation options less favourably (see also Furnham et al., 2008). This was in line with the findings of Arooj et al. (2021), who also found that students using the surface approach tended to prefer MCQs, whilst those using the deep approach tended to prefer short essay questions.

Critiques and limitations are found in all experiments and are essential to identify to thoroughly evaluate the results. A limitation of the experiment could be the asymmetry in the number of male participants compared to female participants. Most of the participants were females (72%; 131). According to Boggiano et al. (1991), females tend to be more extrinsically motivated than men causing an unevenness in the sample which could cause skewed data (if not accounted for). The results could have possibly looked different with a sample consisting of the same number of each/all genders. Furthermore, the data collected for the study was conducted using self-report measures. This means that social desirability bias could have also taken place. This is the tendency to underreport socially undesirable attitudes and behaviours and to over report more desirable attributes (Latkin et al., 2017). Social desirability bias tends to be higher when the situation encountered is more unethical or information provided more sensitive (Latkin et al., 2017), therefore we expect it did not unduly affect the results in this study. Ethnicity of participants could also be a confounding variable as it has been shown that some ethnicities are more inclined to be more intrinsically motivated than others (D'Lima et al., 2014). Their results showed that African American and Caucasian students were more academically self-efficacious than Asian American students. Also, African American and Asian American students were initially more extrinsically motivated than Caucasian students; however, by the end of the semester, all ethnic groups were similar on extrinsic motivation.

Conclusion

This study aimed to explore the relationship between motivation, learning approaches, and assessment preferences among students. It hypothesised that intrinsically motivated learners would adopt deep learning approaches and prefer assessments requiring critical thinking, while extrinsically motivated learners would adopt surface learning approaches and prefer assessments focused on more superficial recollection. The results confirmed that intrinsic motivation significantly predicted deep learning approaches, aligning with SDT (Deci & Ryan, 1985). Students with higher intrinsic motivation favoured assessments that allowed autonomy, such as portfolios and concept maps. Conversely, extrinsic motivation did not significantly promote deep learning, with extrinsically motivated students preferring surface learning approaches and assessments like MCQs. Identified regulation positively influenced deep learning, while amotivation negatively impacted learning strategies, highlighting the importance of autonomous motivation in enhancing learning outcomes.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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