MOTIVATION STRATEGIES OF EX-MATHEMATICAL LITERACY LEARNERS IN A UNIVERSITY FOUNDATION PROGRAMME

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Abstract–Ex-Mathematical Literacy learners are currently excluded from directly gaining admission to undergraduate studies in Commerce and Technology at most South African Higher Education Institutions (HEIs). Certain HEIs do provide access to these students through pathway, foundation or extended degree programmes, usually incorporating a minimum level of mathematics competence. Additional intervention strategies have been recognised by a private HEI, but not formally investigated. The purpose of this study is to determine the role of motivation strategies in the academic orientation of ex-Mathematical Literacy learners in order to refine a private institution's current foundational intervention. A quantitative design was adopted, exploring the motivation factors of the *Motivation and Strategies for Learning Questionnaire* (MSLQ). Participants were a purposive sample of 419 Foundation Programme students; of which 106 were ex-Mathematical Literacy learners. The latter group displays significant lower levels of motivation than their mathematics counterparts, in certain MSLQ items. The findings have practical significance and implications for designers and facilitators of foundation programmes.

Keywords: Mathematical Literacy; University foundation programme; Student motivation; Mathematics achievement; Motivation and Strategies for Learning Questionnaire (MSLQ)

1. INTRODUCTION AND PURPOSE

Learners choosing Mathematical Literacy at matriculation level are not expected to consider further studies in disciplines requiring mathematics (South African Department of Education [SA DoE], 2008). Business Science and Computer and Information Science are two such disciplines. Four per cent of any matriculating cohort (Jansen, 2012) achieves the necessary results to enter undergraduate studies in these disciplines and only half of these are likely to graduate (Council for Higher Education [CHE], 2012). The South African Government ([SA Gov], 2010, p. 1) adopted a performance outcome to redress this situation by aiming to develop a "skilled and capable workforce to support an inclusive growth path."

To attain this, the South African Higher Education and Training department aims to "[i]ncrease access to programmes leading to intermediate and high level learning" (South African Higher Education and Training [SA HET], 2012, p. 4). Higher Education South Africa (HESA) (2009, p. 7) recognises the commitment of HEIs to increasing access, but states that these steps "have to be accompanied by strategies aimed at ensuring success". Strategies to date have incorporated student support systems, interventions and pathway programmes, including extended degree- and foundation programmes.

Few strategies to increase access to undergraduate studies and ensure success have expanded study opportunities for ex-Mathematical Literacy learners at public HEIs; the extended degree in Commerce at the University of Johannesburg[2] is one. Monash South Africa (MSA) offers Mathematical Literacy matriculants achieving at least 50% the opportunity to complete a Foundation Programme intervention year with the aim of articulating to undergraduate studies in Business

[2] Students achieving at least 70% for Mathematical Literacy may apply to enrol in a four-year extended degree, other requirements notwithstanding (University of Johannesburg, 2014).

Science or Computer and Information Science[3]. Opportunities like these may necessitate additional academic support for ex-Mathematical Literacy learners, but the need for and nature of non-academic support mechanisms also needed to be explored.

No formal studies in South Africa have been found, which involve ex-Mathematical Literacy learners enrolled in foundation programmes, aiming to articulate to undergraduate studies in Business Science and Computer and Information Science. To create an effective intervention strategy that optimally addresses the needs of ex-Mathematical Literacy learners, both academic and non-academic support components should be identified and studied. One non-academic component that has been identified by other studies (Allie & Scott, 2009; Bye, Pushkar & Conway, 2007; Dunn, Lo, Mulvenon & Sutcliffe, 2011; Lubben, Davidowitz, Buffler, Zerpa, Hachey, Van Barneveld & Simon, 2011) is motivation (described in Section 2 below). The research question for this paper is thus: How does the motivation of ex-Mathematical Literacy learners compare with the motivation of ex-mathematics[4] learners, enrolled for the MSA Foundation Programme in 2014? The purpose of this study is two-fold. The first purpose is to investigate and compare the motivation of ex-Mathematical Literacy learners with that of ex-mathematics learners in the Monash South Africa Foundation Programme (MSAFP). The second, broader purpose is to use this information to determine whether it is appropriate to incorporate motivational strategies into the mathematics intervention strategy, which forms part of the abovementioned Foundation Programme unit.

2. LITERATURE REVIEW

2.1. Theoretical framework

Before the development of the Motivation and Strategies for Learning Questionnaire (MSLQ), many "study skills inventories were criticized for having no theoretical basis" (Artino, 2005, p. 2). Pintrich, Smith, Garcia & McKeachie (1993, p. 801) developed the MSLQ, based on a social-cognitive view of motivation to be a "self-report instrument designed to assess college students' motivational orientations." The purpose of the MSLQ is to create a general model to understand the motivation (and learning strategies) of university students (Artino, 2005). The model postulates a direct link between motivation and self-regulated learning. Students who display self-regulation are described by Zimmerman (1989, p. 329) as "metacognitively, motivationally, and behaviorally active participants in their own learning process".

Pintrich (2003) proposes a motivational science framework to integrate and unify findings in studies about motivation research, with three core themes. Firstly, research about motivation can be approached from a scientific perspective, supported by empirical evidence. Secondly a multidisciplinary approach is necessary to understand elements of human behaviour such as motivation. Lastly, researchers should strive to meet two goals, the scientific understanding of motivation and the practical application of the results.

Pintrich's socio-cognitive view of motivation thus serves as the theoretical framework for this research. It assumes that motivation is course specific and that learning approaches may vary according to the student's perception of a course. This assumption allows course-related motivation, rather than motivation in general to be studied, measured and reported on, with the understanding that different levels of motivation could be reported by the same participant in different courses (Duncan & McKeachie, 2005). In keeping with the theoretical framework of the MSLQ, no norms have been developed for this instrument (Artino, 2005).

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[3] Other requirements include an Academic Progress Score (APS) of at least 23 and a pass for the English subject (Monash South Africa, 2014).

[4] Mathematics in this context refers to National Senior Certificate Core Mathematics, widely known as mathematics.

2.2. Motivation in the context of this study

Motivation has been studied as a component of psychology as far back as Descartes, who postulates the construct instinct psychology, which then developed along two positions: molecular (a study of the parts) and molar (a study of the whole) psychology (Cassel, 1952). More recent motivation studies have popularised intrinsic and extrinsic motivation types. The difference between motivation, which is innate and which is externally driven is established in classic motivation theories, such as Maslow's hierarchy of needs (Maslow, 1943), McGregor's theory X and theory Y (McGregor, 1960), and Herzberg's Motivation-Hygiene theory (Herzberg, Mausner & Snyderman, 1959).

The word motivation is derived from the Latin movere, which means 'to move' (Schunk, Pintrich & Meece, 2014). Deci and Ryan (2000, p. 227) explain that "contemporary theories of motivation assume that people initiate and persist at behaviours to the extent that they believe the behaviours will lead to desired goals or outcomes." Cherry (2014, para. 1) concurs that motivation is the "process that initiates, guides and maintains goal-oriented behaviours. Motivation is what causes us to act," … "It involves the biological, emotional, social and cognitive forces that activate behaviour".

Several studies investigating goal orientation and goal-oriented behaviour were detected (compare Coutinho & Neuman (2008); Deci & Ryan (2000); Meece, Anderman & Anderman (2006); Payne, Youngcourt & Beaubien (2007) and Watkins, McInerney, Akande & Lee (2003)). Goal orientation is described by Vandewalle (1997, p. 995) as "an individual disposition toward developing or demonstrating ability in achievement situations". Pintrich (2003) expands on the work of Deci and Ryan (2000) to note that this disposition may originate intrinsically or extrinsically. More studies agree that self-efficacy is positively correlated with goal-oriented behaviour (Coutinho & Neuman, 2008; Meece, Anderman & Anderman, 2006; Payne, Youngcourt & Beaubien, 2007).

Pintrich, Smith, Garcia & McKeachie (1991) developed an educational research mechanism (the MSLQ), which considers various components of motivation, including information around goal-oriented behaviour and self-efficacy. This questionnaire has been widely used in empirical research and also to determine potential opportunities for intervention (Artino, 2005). It has been extensively used across culture and language divides and has undergone validity and reliability testing in three languages and has been shown to have sound, albeit moderate predictive validity (Artino, 2005).

Seven overarching questions are the basis for the motivation category of the MSLQ. These questions (Pintrich, 2003) explore ideas such as: What do students want? How do students get what they want? Do students know what they want or what motivates them? What motivates students in classrooms? How does motivation lead to cognition or cognition to motivation? How does motivation change and develop? What is the role of context and culture? The 31 resulting statements in the motivation category of the MSLQ are grouped into six components, presented in table 1.

Table 1: Components of the motivation category of the MSLQ

Motivation category	Value components	Intrinsic Goal Orientation
		Extrinsic Goal Orientation
		Task Value
	Expectancy components	Control of Learning Beliefs
		Self-efficacy for Learning and Performance
	Affective component	Test Anxiety

Intrinsic goal orientation relates to Maslow's self-actualisation and concerns the "student's perception of the reason why she [or he] is engaging in a learning task" (Pintrich et al., 1991, p. 12). Extrinsic goal orientation refers to external factors, such as reward or competition, which compel action toward a goal; the course is perceived as a means to an end, rather than an end in itself. Task value considers the expected importance, interest and usefulness of the course. These components

determine the value that the student places on the course and informs the level of involvement the student will invest in her/his learning.

The expectancy component investigates the student's opinions regarding the results that they believe their actions will achieve. Students who are confident that their learning efforts result in positive outcomes, who feel in control of their academic achievement and able to perform to the expectations they set, will rate the two categories in the expectancy component highly. Test anxiety is inversely related to the expectancy component and thus learning and performance. Two elements comprise this component. Worry is a cognitive element that interrupts the ability to perform correctly, while anxiety is an emotional element with physiological implications.

Studies that use questionnaires such as the MSLQ have become popular and central to research in learning and teaching contexts (Pintrich, 2003). Tuan, Chin and Shieh (2012) concur that attitude and motivation are two of the most important factors to predict student achievement and use the MSLQ as a basis for comparison in the study of motivation in science scholars. Lin and Lui (2010) and Mousoulides and Philippou (2005) have modified the MSLQ to research links between motivation and mathematics. Bong, Cho, Ahn and Kim (2012) and Van der Walt, Maree and Ellis (2008) utilise the MSLQ, in addition to other assessment tools, to predict student motivation in mathematics and study the implications of this for education. Payne and Israel (2010) have used the MSLQ as a performance prediction tool for the development of interventions for mathematics students in South Africa prior to the adoption of the Outcomes Based Education (OBE) approach.

3. RESEARCH DESIGN, DATA COLLECTION AND PARTICIPANTS

3.1. Research approach

The investigation adopted a quantitative approach, based on the assumption that the variables of interest (the motivation strategies of first year Foundation Programme students, enrolled at a private HEI) can be enumerated and measured. This approach is therefore post positivist (Heppner & Heppner, 2004, p. 143), which presumes that an external reality exists independent from this research, and that this reality cannot fully be known. From this perspective, the aim of the empirical inquiry is to investigate how the motivation components of ex-Mathematical Literacy learners, who have enrolled for a Foundation Programme at a private HEI, compare to the corresponding components of ex-mathematics learners in the same programme. The findings might generate guidelines that can be used to optimise student support in the aforementioned Foundation Programme. The post positivist approach does not aim to generate theories, models or frameworks that reflect absolute truths about the reality of the participants. The empirical outcomes should rather be judged with respect to their usefulness (substantively and practically).

3.2. Data collection instrument and administration

The MSLQ was used for data collection in this study. It is a "self-report instrument designed to assess … motivational orientations and the[ir] use of different learning strategies, … based on a general cognitive view of motivation and learning" (Pintrich et al., 1993, p. 3). The MSLQ consists of 81 statements, to which participants should respond according to a seven-point Likert scale from **1** (not at all true of me) to **7** (very true of me) with **4** being neutral. The first 31 statements explore the value, expectancy and affective components of motivation. Data collection was administered during the mathematics class in the second week of the first semester (in March).

3.3. Participants

The population for this study encompassed 482 students enrolled in the Business, Information Technology and Health streams in the Foundation Programme of MSA, selected as a purposive, convenience sample. Forty-five students chose not to take part in the study and two students who completed the questionnaire left the MSAFP during the semester.

Eventually 437 students (90.7% of the population) completed the questionnaire. The data of 18 of these students could not be utilised for various reasons, which finally provided 419 students' data (86.9% of the population) for analysis. The latter group comprised 106 (25.3%) ex-Mathematical

Literacy-, 183 (43.7%) ex-Mathematics Core- and 130 (31.0%) 'other' learners, who were not exposed to either of the former mathematics course options in their final school year. The demographic breakdown of the three groups in respect of gender and final school year mathematics choice is outlined in Table 2 below.

Table 2: Participant breakdown in respect of gender and mathematics choice

	Ex-Math Literacy	Ex-Math Core	'Other' Math	Total
Female	46	88	55	189 (*45.1%*)
Male	60	95	75	230 (*54.9%*)
Total	**106** (*25.3%*)	**183** (*43.7%*)	**130** (*31.0%*)	**419** (*100.0%*)

Analyses and comparisons in this paper only involve the ex-Mathematical Literacy- and the ex-Mathematics Core learner groups.

3.4. Ethics, validity and reliability

The Research Ethics Committees of both the University of Johannesburg (the paper forms part of the first author's Master's studies) and MSA (home institution of the participants) granted clearance for the study. Permission to use the MSLQ was obtained from W.J. McKeachie, one of the original designers of the questionnaire (Personal communication, September 23, 2013) and intellectual property rights were recognised. Their rights and interests were explained to the participants and also protected by confidentiality and anonymity measures. Completed questionnaires were also securely stored.

The designers of the questionnaire (Pintrich et al., 1993, p. 4-5), on numerous occasions and by using diverse samples, calculated the correlation of each of the MSLQ scales with final student grades. They concluded that the instrument demonstrates significant *predictive validity*. Results from their confirmatory factor analyses (Pintrich et al., 1993, p. 79-87) indicate that instrument also shows sound *factor validity*. For this study, *content* and *face validity* were confirmed when the MSLQ was sound boarded with three knowledgeable colleagues and then piloted with five students, who have previously completed the MSA Foundation Programme.

The internal consistency (*reliability*) of the data by means of Cronbach's alpha coefficients was calculated for each motivation component in the study. The findings, outlined in Table 3 below, indicate that in respect of five of the six components (*control of learning beliefs* excluded), and also for the cumulative motivation scale, alpha values of between 0.63 and 0.89 were obtained. This resembles a moderate to high internal consistency and level of data reliability for three components with alpha values greater than 0.7. The Cronbach's alpha coefficients are between 0.6 and 0.7 in the case of both intrinsic and extrinsic goal orientation, which is lower that the usually acceptable 0.7.

Table 3. Cronbach's Alphas for each MSLQ motivation component

MSLQ component	Number of items	Alpha* (α)
Intrinsic goal orientation	4	0.630
Extrinsic goal orientation	4	0.643
Task value	6	0.809
Control of learning beliefs	4	0.502
Self-efficacy for learning and performance	8	0.886
Test anxiety	5	0.744
Motivation scale	**31**	**0.848**

*N = 419

4. EMPIRICAL FINDINGS

4.1. Finding an appropriate statistical test

Sampling was conducted in a non-probability (purposive) manner. The Shapiro-Wilk W test (p =.000) generated a significant finding ($p < .01$) on all six motivation components of the MSLQ. This means that a normal distribution of the data cannot be assumed. However, with moderately large data sets ($n > 200$), as is the case in this investigation ($n = 419$), and based on a careful analysis of the distribution's stem-and-leaf and PP plots as well as 'common sense', the researchers rationalised (supported by the Cross Validated website of StackExchange) that a parametric test, like Student's t test would be sufficiently robust to handle this perceived 'non-normality'.

An independent samples t-test was firstly conducted to test for the significance of differences between the mean scores of ex-Mathematical Literacy- and ex-mathematics learners on all six motivation components of the MSLQ. The non-parametric Mann-Whitney U test was subsequently used to analyse differences between the median values and ranked scores on the same six motivation components of these two groups. The Mann-Whitney test results corresponded to and confirmed the initial t-test findings.

4.2. Significant differences between the motivation strategies of the two groups

Tables 4 and 5 below reveal the results of the independent-samples t-test in respect of differences between the mean scores of ex-Mathematical Literacy and ex-mathematics learners on all six motivation components of the MSLQ, including their total motivation score. The t-test indicated significant differences between scores of the two groups in respect of four of the components and the motivation total, with the details as follows:

- **Intrinsic goal orientation**: Scores of ex-mathematics learners (M = 19.4, SD = 4.35) are significantly higher than the scores of the ex-Mathematical Literacy learners (M = 18.0, SD = 4.39), $t(287) = -2.56$, $p < .05$, $d = .31$. Cohen's effect size (.31) is in the small to medium interval (Thalheimer & Cook, 2002, p. 3), which implies that this internal goal orientation difference has a minor to moderate practical significance.
- **Task value:** Scores of ex-mathematics learners (M = 32.44, SD = 6.21) are significantly higher than the scores of the ex-Mathematical Literacy learners (M = 29.66, SD = 6.4), $t(287) = -3.63$, $p < .01$, $d = .44$. Task value differences have a minor to moderate practical significance.
- **Self-efficacy for learning and performance**: Scores of ex-mathematics learners (M = 43.19, SD = 7.49) are significantly higher than the scores of the ex-Mathematical Literacy learners (M = 37.57, SD = 8.28), $t(287) = -5.92$, $p < .01$, $d = .71$. Self-efficacy for learning and performance differences have a moderate to major practical significance.
- **Test anxiety**: Scores of ex-Mathematical Literacy learners (M = 23.78, SD = 6.81) are significantly higher than the scores of the ex-Mathematics learners (M = 21.62, SD = 6.92), $t(287) = 2.58$, $p < .05$, $d = .32$. This test anxiety differences have a minor to moderate practical significance.
- **Total motivation**: Scores of ex-mathematics learners (M = 162.27, SD = 21.24) are significantly higher than the scores of the ex-Mathematical Literacy learners (M = 154.37, SD = 20.63), $t(287) = -3.08$, $p < .01$, $d = .38$. This total motivation difference between the groups has a minor to moderate practical significance.

Table 4: Group statistics

Motivation components	Group	N	Mean	Std. Deviation	Std. Error Mean
Intrinsic goal orientation	**1**	106	18.02	4.386	.426
	2	183	19.38	4.350	.322
Extrinsic goal orientation	**1**	106	23.74	3.895	.378
	2	183	23.88	3.781	.279
Task value	**1**	106	29.66	6.398	.621
	2	183	32.44	6.214	.459
Control of learning beliefs	**1**	106	21.60	3.796	.369
	2	183	21.75	3.593	.266
Self-efficacy for learning and performance	**1**	106	37.57	8.275	.804
	2	183	43.19	7.485	.553
Test anxiety	**1**	106	23.78	6.813	.662
	2	183	21.62	6.918	.511
Total motivation	**1**	106	154.37	20.633	2.004
	2	183	162.27	21.235	1.570

Group 1 = ex-Mathematics Literacy learners **Group 2** = ex-Mathematics learners

Table 5: Independent samples t-test results

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	Df	Sig.(2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
IGO total	EVA	.002	.965	-2.561	287	.011	-1.364	.533	-2.412	-.315
	EVNA			-2.555	217.902	.011	-1.364	.534	-2.416	-.312
EGO total	EVA	.153	.696	-.308	287	.758	-.144	.467	-1.062	.774
	EVNA			-.306	214.107	.760	-.144	.470	-1.071	.783
TVAL total	EVA	.580	.447	-3.629	287	.000	-2.782	.767	-4.291	-1.273
	EVNA			-3.600	214.198	.000	-2.782	.773	-4.305	-1.259
CLB total	EVA	.099	.753	-.336	287	.737	-.150	.448	-1.032	.731
	EVNA			-.331	209.671	.741	-.150	.454	-1.046	.746
SELP total	EVA	1.056	.305	-5.921	287	.000	-5.625	.950	-7.495	-3.755
	EVNA			-5.765	201.936	.000	-5.625	.976	-7.549	-3.701
TANX total	EVA	.367	.545	2.579	287	.010	2.166	.840	.513	3.818
	EVNA			2.589	222.139	.010	2.166	.836	.517	3.814
Motivation total	EVA	.001	.975	-3.080	287	.002	-7.900	2.565	-12.949	-2.851
	EVNA			-3.103	224.597	.002	-7.900	2.546	-12.916	-2.883

IGO = Intrinsic goal orientation
EGO = Extrinsic goal orientation
TVAL = Task value
CLB = Control of learning beliefs
SELP = Self-efficacy for learning and performance
TANX = Test Anxiety
EVA = Equal variances assumed
EVNA = Equal variances not assumed

4.3. Empirical synthesis

Goal orientation relates to the reasons why students are engaging in learning. **Intrinsic goal orientation** "…concerns the degree to which the student perceives herself [or himself] to be participating in a task for reasons such as challenge, curiosity, mastery" (Pintrich et al., 1991, p. 8). The ex-mathematics learners displayed a significantly higher intrinsic goal orientation, than their ex-Mathematical Literacy counterparts. It can be interpreted that ex-mathematics learners, to a greater extent engage in academic tasks in order to be challenged, to have their curiosity stimulated or in striving for mastery. On the other hand, ex-Mathematical Literacy learners, to a significantly larger degree engage in an academic task as a means to an end – so as to get it 'done and dusted' on their way to something more personally satisfying and meaningful.

Extrinsic goal orientation didn't produce significant differences between the scores of the two groups of learners. This motivation component considers the importance of factors such as receiving praise from others and being in competition with others. A finer interrogation of this component's items reveals that ex-Mathematical Literacy learners seem to be less interested in the content area of mathematics than ex-mathematics learners.

While goal orientation considers the reasons why students have chosen to participate in the course, **task value** investigates students' impressions of the interest, importance and usefulness of the course (Pintrich et al., 1991). The significantly higher task value of ex-mathematics learners denotes that these learners regard mathematics as more interesting, important and useful than the ex-Mathematical Literacy group.

Control of learning beliefs is the only component where every item of the component shows no significant difference between the two groups under discussion. Cronbach's Alpha was not able to report that the data gathered for this component was reliable and thus useful. Control of learning beliefs refers to the belief of students that "their efforts to learn will result in positive outcomes" (Pintrich, 2001, p. 12). An interpretation that both ex-Mathematical Literacy and ex-mathematics learners' beliefs that personal effort is positively rewarded can thus not be excluded or accepted.

Bong et al. (2012, p. 337) describe **self-efficacy for learning and performance** as "an individual's subjective convictions in his or her ability to organise and execute actions that are required to achieve a desired outcome in a given context". The findings indicate that ex-mathematics learners are significantly more likely to trust their ability to complete mathematics tasks as they might have more confidence in their abilities than ex-Mathematical Literacy learners.

According to Pintrich et al. (2001, p. 18) test anxiety is comprised of a cognitive component (worry) and an emotional component (anxiety). Both adversely affect expectancy and academic performance. The significantly higher test anxiety result for ex-Mathematical Literacy learners suggest that these learners may experience higher levels of worry and anxiety about test taking in mathematics than ex-mathematics learners.

There is a significant difference between the two groups in respect of their total motivation. Ex-Mathematical Literacy learners displayed a lower level of motivation towards mathematics than ex-mathematics learners. Artino (2005, p. 3) states that within the MSLQ framework, "students' motivation is directly linked to their ability to self-regulate their learning activities". It thus seems as if ex-Mathematical Literacy learners embarking on studies in a foundation programme are not as capable of taking charge of their learning in mathematics as the ex-mathematics learners.

5. IMPLICATIONS OF THE FINDINGS

Based on these findings, ex-Mathematical Literacy learners may not grasp the value of mathematics, or the purpose of a mathematics course for their studies, or they may merely view the subject as a means to an end. Alternatively, they may not find the work interesting, useful or important at this point in their studies. One implication of this is that ex-Mathematical Literacy learners may not place a high value on a foundation programme mathematics course, leading to lower expectancy measures. It is possible that these ex-Mathematical Literacy learners neither expect to be particularly successful in mathematics, nor believe in their ability to master the subject. They are thus likely to worry more and exhibit aspects of anxiety when taking tests.

A suitable strategy might begin with reinforcing ex-Mathematical Literacy learners' control of learning beliefs. Teacher reinforcement that continued hard work is rewarded with positive outcomes may be incorporated more frequently into student conversations. External goal orientation is a further component to address, as ex-Mathematical Literacy learners appear to be as motivated as other students in this component. Offering rewards and/or creating healthy competition that allows ex-Mathematical Literacy learners to be successful may develop their extrinsic goal orientation. This may encourage these students to work conscientiously at the subject and in turn reinforce or build other motivation components.

From an intrinsic goal orientation perspective, ex-Mathematical Literacy learners could be assisted to understand why mathematics is important as an end in itself. Mathematical applications that relate to Business Sciences and Information and Technology Sciences can support this goal. Students need to develop their confidence in working with mathematics in order to foster a passion for inquiry related to the subject so that it is viewed as an end in itself. A passionate, patient teacher, which present work that appears to be useful to all students will assist students to gradually develop their intrinsic goal orientation.

Strategies that assist students to begin to answer questions independently and successfully might increase students' belief in their ability to master the subject. Such strategies may include providing selected questions that can be successfully attempted during class, assisting students to identify sections of work that they can do to build their confidence and the development of their examination preparation techniques. All these strategies may assist with the development of self-efficacy for learning.

Within the test anxiety component, two MSLQ questions were specifically identified as having significant differences in the means of ex-Mathematical Literacy learners and ex-mathematics learners. These questions are: *When I take a test, I think about how poorly I am doing compared with other students* and *I have an uneasy, upset feeling when I take an exam*. Stress and anxiety reducing techniques could be incorporated into the intervention to assist ex-Mathematical Literacy learners to learn how to cope with the anxiety of test taking and the worry of forgetting work. Practice and repetition of mathematical procedures and providing practice questions that these students are able to attempt, might also decrease their anxiety levels.

6. CONCLUSION

The focus of this paper is to identify and understand differences in the motivation of ex-Mathematical Literacy learners and ex-mathematics learners enrolled in a foundation programme at a private university. The MSLQ, a tool used in hundreds of studies world-wide (Artino, 2005) was chosen as an appropriate data collection instrument. The research revealed that ex-Mathematical Literacy learners display a lower level of motivation towards mathematics than ex-mathematics learners. The current mathematics intervention should ideally be adapted to include a motivation and self-regulation section specifically geared at the learning of mathematics.

REFERENCES

Artino, A. R. (2005). A review of the motivated strategies for learning questionnaire. Retrieved from http://www.sp.uconn.edu/~aja05001/comps/documents/MSLQ_Artino.pdf

Bong, M., Cho, C., Ahn, H. S., & Kim, H. J. (2012). Comparison of self-beliefs for predicting student motivation and achievement. *The Journal of Educational Research*, 105(5), 336-352, doi: 10.1080/00220671.2011.627401

Bye, D., Pushkar, D., & Conway, M. (2007). Motivation, interest and positive affect in traditional and nontraditional undergraduate students. *Adult Education Quarterly*, 57(2), 141-158, doi: 10.1177/0741713606294235

Cassell, R. N. (1952). Motivation as a synthesis of contemporary psychology. *Journal of Educational Psychology*, 43(3), 157-166, doi: 10.1037/h0059427

Cherry, K. (2014). What is motivation? *About.com Psychology*. Retrieved from http://psychology.about.com/od/mindex/g/motivation-definition.htm

Council on Higher Education. (2012). *Vital Stats Public Higher Education 2010*. Retrieved from http://www.che.ac.za/media_and_publications/monitoring-and-evaluation/vital-stats-public-higher-education-2010

Coutinho, S. A., & Neuman, G. (2008). A model of metacognition, achievement goal orientation, learning style and self efficacy. *Learning Environ Res*, 11, 131-151, doi: 10.1007/s10984-008-9042-7

Deci, E. L., & Ryan, R. M. (2000). The 'what' and 'why'of goal pursuits: human needs and the self-determination of behaviour. *Psychological Inquiry: An International Journal for the Advancement of Psychological Theory*, 11(4), 227-268, doi: 10.1207/S15327965PLI1104_01

Dunn, K. E., Lo, W. J., Mulvenon, S. W., & Sutcliffe, R. (2011). Revisiting the motivated strategies for learning questionnaire: A theoretical and statistical re-evaluation of the metacognitive self-regulation and effort regulation subscales. *Educational and Psychological Measurement*, 72(2), 312-331. Retrieved from http://epm.sagepub.com.ezproxy.lib.monash.edu.au/content/72/2/312

Heppner, P. P., & Heppner, M. J., (Eds). 2004. Writing and publishing your thesis, dissertation and research. A guide for students in the helping professions. Belmont, CA: Brooks/Cole-Thomson Learning.

Herzberg, F., Mausner, B., & Snyderman, B. (1959). *The motivation to work*. New York: Wiley.

Higher Education South Africa [HESA]. (2009). Pathways to a diverse and effective South African Higher Education System: Strategic Framework 2010 / 2020. Retrieved from http://www.hesa.org.za/strategic-plan

Jansen, J. D. (2012, January 7). Matric razmatazz conceals sad reality. *IOL News*. Retrieved from http://www.iol.co.za/news/south-africa/western-cape/matric-razmatazz-conceals-sad-reality-1.1209349#.UYDEkVIyfCY

Liu, E. Z. F., & Lin, C. H. (2010). The survey study of mathematics motivated strategies for learning questionnaire (MMSLQ) for grade 10-12 Taiwanese students. *The Turkish Online Journal of Educational Technology*, 9(2), 221-233. Retrieved from http://www.tojet.net/articles/v9i2/9223.pdf

Lubben, F., Davidowitz, B., Buffler, A., Allie, S., & Scott, I. (2009). Factors influencing access student's persistence in an undergraduate science programme: a South African case study. *International Journal of Educational Development*, 30 (2010) 351-357, doi: 10.1016/j.ijedudev.2009.11.009

Maslow, A. H. (1943). A theory of human motivation. *Psychological Review*, 50(4), 370-396. Retrieved from http://psycnet.apa.org.ezproxy.lib.monash.edu.au/journals/rev/50/4/370/

McGregor, D. (1960). *The human side of enterprise*. New York: McGraw-Hill.

Meece, J. L., Anderman, E. M., & Anderman, L. H. (2006). Classroom goal structure, student motivation, and academic achievement. *Annual Review of Psychology*, 57, 487-503, doi: 10.1146/annurev.psych.56.091103.070258

Mousoulides, N., & Philippou, G. (2005). Students' motivational beliefs, self-regulation strategies and mathematics achievement. In Chick, H. L. & Vincent, J. L. (Eds.). *Proceedings of the 29th Conference of the International Group for the Psychology of Mathematics Education*, 3, 321-328. Melbourne: PME. Retrieved from http://www.emis.ams.org.ezproxy.lib.monash.edu.au/proceedings/PME29/PME29CompleteProc/PME29Vol3Fug_Mou.pdf#page=327

Monash South Africa. (2014). *Undergraduate course guide 2013 / 2014*. Ruimsig: Monash South Africa.

Payne, J., & Israel, N. (2010). Beyond teaching practice: exploring individual determinants of student performance on a research skills module. *Learning and Individual Differences*, 20 (2010), 260-264. Retrieved from http://www.sciencedirect.com.ezproxy.lib.monash.edu.au/science/article/pii/S1041608010000245

Payne, S. C., Youngcourt, S. S., & Beaubien, J. M. (2007). A meta-analytic examination of the goal orientation nomological net. *Journal of Applied Psychology*, 92(1), 128-150. Retrieved from http://psycnet.apa.org.ezproxy.lib.monash.edu.au/journals/apl/92/1/128/

Pintrich, P. R., Smith, D. A., Garcia, T., & McKeachie, W. J. (1991). A manual for the use of the Motivated Strategies for Learning Questionnaire (MSLQ). Retrieved from http://files.eric.ed.gov/fulltext/ED338122.pdf

Pintrich, P. R., Smith, D. A., Garcia, T., & McKeachie, W. J. (1993). Reliability and predictive validity of the Motivated Strategies for Learning Questionnaire (MSLQ). *Educational and Psychological Measurement, 53,* 801–813, doi: 10.1177/0013164493053003024

Pintrich, P. R. (2003). A motivational science perspective on the role of student motivation in learning and teaching contexts. *Journal of Educational Psychology*, 95(4), 667-686.

Schunk, D. H., Pintrich, P. R., & Meece, J. (2014, April 23). *Motivation*. Retrieved from http://library.ucol.ac.nz/~upload/Library%20Documents/APA_Beginners_Guide_6th_edition.pdf

South African Department of Education. (2008). *National Curriculum Statement grades 10-12 (learning programme guidelines): Mathematical Literacy*. Retrieved from http://www.education.gov.za/LinkClick.aspx?fileticket=vJ3zZ5OVRdI%3D&tabid=248&mid=596

South African Government. (2010). *Key issues: the outcomes approach*. Retrieved from http://www.gov.za/issues/outcomes/index.html

South African Higher Education and Training. (2012). *Strategic plan revised version*: *March 2012*. Retrieved from http://planipolis.iiep.unesco.org/upload/South%20Africa/South%20Africa_Strategic%20plan%20revised_2012.pdf

Thalheimer, W., & Cook, S. (2002). How to calculate effect sizes from published research articles: A simplified methodology. Retrieved from http://www.bwgriffin.com/gsu/courses/edur9131/content/Effect_Sizes_pdf5.pdf

Tuan, H. L., Chin, C. C., & Shieh, S. H. (2005). The development of a questionnaire to measure student's motivation towards science learning. *International Journal of Science Education*, 27(6), 639-654, doi: 10.1080/0950069042000323737

University of Johannesburg. (2014). *Extended BCom degrees*. Retrieved from http://www.uj.ac.za/EN/Faculties/ecofin/coursesandprogrammes/Pages/1Foundationprogramme.aspx

Van der Walt, M. S., Maree, J. G., & Ellis, S. M. (2008). Metacognition in the learning of mathematics in the senior phase: some implications for the curriculum. *International Journal of Adolescence and Youth*, 14(3), 205-235, doi: 10.1080/02673843.2008.9748004

Vandewalle, D. (1997). Development and validation of a work domain goal orientation instrument. *Educational and Psychological Measurement*, 57(6), 995-1015, doi: 10.1177/0013164497057006009

Watkins, D., McInerney, D., Akande, A., & Lee, C. (2003). An investigation of ethnic differences in the motivation and strategies for learning of students in desegregated South African schools. *Journal of Cross-Cultural Psychology*, 2003(34), 189-194, doi: 10.1177/0022022102250563

Zerpa, C., Hachey, K., Van Barneveld, C., & Simon, M. (2011). Modeling student motivation and students' ability estimates from a large-scale assessment of mathematics. *SAGE Open*, *1*(2), doi: 10.1177/2158244011421803

Zimmerman, B. J. (1989). A social cognitive view of self-regulated academic learning. *Journal of Educational Psychology*, 81(3), 329-339. Retrieved from http://psycnet.apa.org.ezproxy.lib.monash.edu.au/journals/edu/81/3/329/