



Development and validation of self-managed learning tool for students in universities in Rivers state

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Abstract

In recent times, it has been observed that amidst so many distractions, some students fail to dedicate time to managing their learning experiences which could lead to examination malpractice and/or backlog of carryovers. It is therefore necessary to have a tool that assesses students' ability to manage their leaning experiences. Against this background, this study developed and validated a self-managed learning tool for students of universities in Rivers State. Instrumentation research design was used to develop the tool and Zimmerman's cyclical model was adopted. The theories that guided the study were self-managed learning and item response theories. The population was 71,778, and a sample of 1,440 students was drawn using multi-stage sampling procedure. Four research questions were answered using excel, SPSS, and R while one null hypothesis was tested using chi square. The overall MSA was 0.76 which is rated as adequate. Three factors were loaded with eigen values of 4.93, 2.97 and 1.64. The findings indicated that there was a significant difference between the negative and positive items. The ordinal reliability coefficient was 0.85 Alpha was recommended among others that lectures in the universities should encourage students to imbibe the habit of managing their learning because it will help them to expand their knowledge academically.

Keywords: Self-managed learning, item response theory, Instrumentation

Introduction

At birth some philosophers believe that a baby's mind is blank and only gets filled by the learning experiences acquired during the growth stages. A new baby is usually breastfed with a substance known as colostrums, which contains some essential nutrients to help in the baby's cell development. All the baby needs to do at this neonatal stage is to suck and sleep. As the infancy period goes on the infant learns to consume other types of food like solid food, mashed food, cereals, and so on. The youngster eventually learns how to stand, sit, walk, and run. As the kid grows older, he or she reaches the age when he or she may attend school with other students and participate in academic activities. Learning continues from when a child is born to death. Learning is therefore viewed by Mayer (2020) as a somewhat long-lasting shift in one's perspective or mindset brought about by new information. Furthermore, learning could be seen as a proportionately lasting activity that leads to practical moderation in behavior (Ellis, 1965 as cited in Nwankwo, 2007) ^[16]. Learning originates from activities or practices that showcase a change in attitude. If there is no change in one's lifestyle from the previous to the new and desired one, then learning has not occurred. Nwankwo (2007) ^[16] explained that learning is the result of former exposure. It means that someone can learn from past experiences. Hence there is a proverbial statement which says that experience is the best teacher. (Nwankwo 2007) ^[16] added that learning occurs not just by experience but also by practice.

Onyenemezu (2017) ^[18] views learning as a progressive activity; hence, despite the length of one's years, status, wealth, or fame, nobody will consciously want to stop acquiring knowledge. Mbagwu (2012) ^[15] opined that the steps involved in learning start from the child taking part in unofficial education which is usually directed by members of the person's immediate family; after which, the child is

taught by the environment and educational institutions. He also noted that though it is not mandatory to learn, people are motivated to do so because of individual needs which include being able to provide material needs, gain self-worth and improve techniques needed in the workplace, improvement of trade and financial rewards. Santrock (2009) ^[21] observed that learning does not just influence how somebody behaves but also his or her understanding and reasoning abilities. Thus, it can be concluded that learning denotes modification in the manner with which an individual conducts himself.

Learning does not necessarily have to take place in the traditional classroom setting, people can build up ability to manage their leaning experiences. Self-managed learning could be viewed as the way learners control their feelings, reasoning, attitude as well as the context when learning is going on (Harding, Barta, and Goh, 2016) ^[11]. Furthermore, self-managed learning is the act of building on one's thought, emotion, and attitude to guide him judiciously in attaining the desired goals (Santuuck, 2009) It involves having a well defined purpose of action, channeling one's activities in such a way that the stated objectives are achieved, monitoring the processes involved in achieving the goals and learning from the mistakes so as to make amendments where necessary. The whole process takes a lot of determination and self-motivation.

Scholars who are able to self-manage their learning usually take charge of what they learn in order to achieve success (Foong, Ghouse, and Vadivelu, 2021) ^[8]. Self-managed learners do not need to be coerced to learn, rather they arrange or set out a guide showing what is to be learned, how it will be done, and what is to be achieved. The learner is focused hence he is not easily distracted. Self-managed learners are versatile in knowledge and resilient. They have the discipline that will enable them to learn both what is taught during lectures and other fields of interest. Nobody

can ever become big without aiming at success, getting committed to the goals, and also exhibiting the habit that will lead to success. Self-managed learners are regarded by Ganda and Boruchoritch (2018) [10] as individuals who are coordinated, energetic, and very curious to learn. They think ahead and are not lazy in their day-to-day activities. They do not participate in other social activities like partying, or visitations. The attribute of self-managed learners as recommended by Winnie (2001) include setting targets so that their learning capacities can be enhanced.

It is however disheartening to note that some students who are admitted into the higher institutions of learning are not focused hence they get easily distracted by peer groups and other socializations. Such students often rush through their books whenever it is time for an examination. The result of this unpreparedness makes them to indulge in examination malpractices. Carnegie (2010) opined that students who are focused in their studies will be capable of paying less attention to interferences and Glenn (2001) remarked that students usually find it difficult to regulate their studies. They do not set aside time for learning on their own. Eventually, this will lead them to graduate with poor grades or end up as school dropouts. It is on this remark that it becomes necessary to develop a self-managed learning tool for students in the universities.

Aim and objectives of the study

The aim of the study is to develop a self-managed learning tool for students in the universities in Rivers State. In specific terms, the objectives of the study include to

1. Determine the factor adequacy level of the students’ self-managed learning tool.
2. Determine the factor structure of the students’ self-managed learning tool
3. Determine the ordinal reliability coefficient of the students’ self-managed learning tool
4. Determine the item information function of the students’ self-managed learning tool.

Research Questions

1. What is the factor adequacy level of the students’ self-managed learning tool?
2. What is the factor structure of the students’ self-managed learning tool?
3. What is the ordinal reliability coefficient of the students’ self-managed learning tool?
4. What is the item information function of the students’ self-managed learning tool?

Hypothesis

1. There is no significant difference between the positive and negative items of the students’ self-managed learning tool.

Methods

The research design used for this study was instrumentation design. Instrumentation research design is the technique used in analyzing information gathered in specific areas of concern (Salkind, 2010) [20]. Instrumentation research design is therefore considered the most appropriate design for developing and validating this self-managed learning tool. This research study was carried out in the three universities in Rivers State. The population of students as at November, 2022 was estimated at 71,778; out of which a sample of 1,440 students was drawn using multi-stage sampling

technique. Purposive sampling technique was used to identify the universities in Rivers State and also to select faculties within the selected institutions. Accidental sampling technique was used to draw students that participated in the study. The instrument used for data collection was developed and validated by the researchers with the assistance of experts in educational measurement and evaluation. A four-likert scale of strongly agreed, agreed, disagreed and strongly disagreed was used to respond to the items in the instrument. One hundred and fifty (150) items were developed and administered to three hundred (300) respondents who were similar but not part of the study. The scores generated were subjected to item analysis and items whose factor loads fell below 0.5 were discarded, thereby reducing the items from 150 to 70.

With the help of three research assistants the 70 items were administered to 1,440 students selected for the study. The data generated from the students were analysed using statistical package for social sciences (SPSS) version 25 items 41 to 45 had slopes of 0.09 and below and they were therefore discarded. The items were then reduced from 45 to 40. Hence it was concluded that the instrument has high psychometric properties and should be used by the students in the universities for self-managing their learning.

Results

Research question one: What is the factor adequacy level of the students’ self-managed learning tool?

The forty items were subjected to Kaiser-Meyer-Olkin statistical package for social sciences version 25 and the result is presented in Table 1:

Table 1: Kaiser-Meyer-Olkin Factor adequacy output from SPSS version 25 for the students’ self-managed learning tool

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.758
Bartlett's Test of Sphericity	Approx. Chi-Square	16838.517
	Df	780
	Sig.	.000

In order to confirm the result in table 1, the data for the forty items were also subjected to Kaiser- Meyer-Olkin factor adequacy in R psych package of R statistics programming language. The output is presented in table 2:

> KMO (ussis)
 Kaiser-Meyer-Olkin factor adequacy
 Call: KMOrrussis)
 Overall MSA 0.76

Table 2: A brief version of Kaiser-Meyer-Olkin factor adequacy from R Psyche

Items	KMO Value
1	0.68
2	0.65
3	0.66
4	0.76
5	0.73
6	0.74
7	0.65
8	0.75
9	0.57
10	0.72

Table 1 showed that the Kaiser-Meyer-Olkin factor adequacy level computed by statistical package for social sciences (SPSS) version 25 was 0.758 while that computed by Rpsyche programming package version was 0.76. Since the overall Measure of sampling adequacy (MSA) from both statistical package for social sciences (SPSS) and that from R Psyche programming package approximated to 0.76, it

indicates that the factor adequacy level of students' self-managed learning tool is adequate, hence the factor structure can be computed.

Research Question two: What is the factor structure of students' self-managed learning tool?

Table 2: A compressed factor structure matrix for students' self- managed learning tool

Items	Factor MR1	Factor MR1 ²	Factor MR32	MR2 ²	Factor MR3	MR3 ²	Communality h ²
1	-0.01	0.0001	0.42	0.1764	0.04	0.0016	0.1781
2	0.02	0.0004	0.32	0.1024	-0.13	0.0169	0.1197
3	0.03	0.0009	0.50	0.2500	0.03	0.0009	0.2518
4	0.06	0.0036	0.40	0.1600	0.07	0.0049	0.1685
5	-0.02	0.0004	0.45	0.2025	-0.05	0.0025	0.2054
Eigen values Σ(F1, F2, F3)		4.9333		2.9704		1.6392	F1, F2, F3 9.5429
% of total variance $\left(\frac{4.9333}{40}\right) \times 100$		12.33325		7.426		4.098	23.85725
% of total community $\left(\frac{12.33325}{23.8525}\right) \times 100$		A 51.6902532		B 31.12680632		C 17.17717	A+B+C 100

Table 2 showed that the eigen values for factors 1, 2, and 3 all squared were 4.93, 2.97, and 1.64 respectively and they were all greater than one which indicates that all the factors loaded well. Since the eigen values squared were greater than one, it confirmed that students' self-managed learning tool was multi-dimensional. This implied that multi-dimensional item response theory would be applied in

assessing the psychometric properties of this instrument. Similarly, the total variances for square of factors 1, 2, and 3 were 12.33, 7.43, and 4.10 respectively, and the total communality was 23.86. The percentage communality for square of factors 1, 2, and 3 were 51.70, 31.13 and 17.17 which gave a total sum of 100% for the communality.

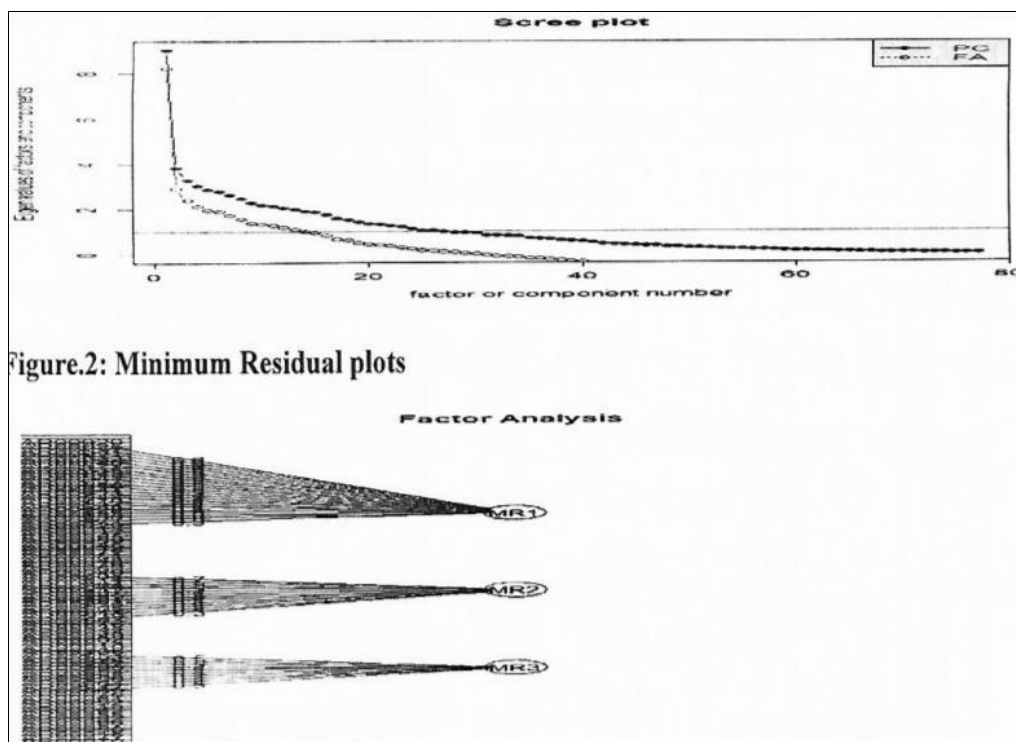


Fig 1: Scree Plot for exploratory factor analysis

The scree plot is a graph which gives a picture of the eigen values plotted against the component numbers. An eigen value is either plus (+) or minus (-). The scree plot showed that the eigen values of this factor structure were positive and the values were also above zero which indicated that the result was good. The curve slopes from the vertical axis to

the horizontal axis gradually and steadily laped with the component number lines which confirmed that the preceding factor loads get smaller in quantities of the total variance. The first component got the largest total variance followed by the others. This indicated that the eigen value, total variance and communalities reduced systematically.

The graph showed the marking point to eleven, which means that it is possible for factors to load up to eleven (11) components after which it will no longer be useful for further component extraction. This explained why the slope got smaller after the marking point and almost lapped with the component number axis.

Research Question three: What is the ordinal reliability coefficient of students' self-managed learning tool?

Table 3: Cronbach reliability coefficient of students' self-managed learning tool

	Cronbach's Alpha Based On Standardized	
Cronbach's Alpha	Items	N of Items
0.854	0.851	40

VAR00003	0.85	0.85	0.09	0.135.6	0.0056	0.013	0.12
VAR00004	0.85	0.85	0.09	0.135.6	0.0056	0.013	0.12
VAR00005	0.85	0.85	0.89	0.125.5	0.0056	0.013	0.12
VAR00006	0.85	0.85	0.89	0.125.5	0.0057	0.013	0.12
VAR00007	0.85	0.85	0.90	0.135.7	0.0055	0.013	0.13
VAR00008	0.85	0.85	0.89	0.135.6	0.0056	0.013	0.12
VAR00009	0.85	0.85	0.89	0.135.7	0.0055	0.013	0.13
VAR00010	0.85	0.85	0.89	0.135.6	0.0055	0.013	0.12

Tables 3 and 4 showed that the Cronbach Alpha reliability coefficient was 0.85 and the ordinal Alpha coefficient was 0.85. The two tables indicated an Alpha reliability coefficient value of 0.85, hence this implies that the students' self-managed learning tool is reliable.

Hypothesis one: There is no significant difference between the positive and negative questionnaire items.

Table 5: A Chi square test for students' self-managed learning tool

Item no.	Chi-square value	Degree of freedom (df)	Critical value of chi square	Observation
1	816.613a	3	7.82	Significant
2	1135:485a	3	7.82	Significant
3	1095.554a	3	7.82	Significant
4	731.295a	3	7.82	Significant

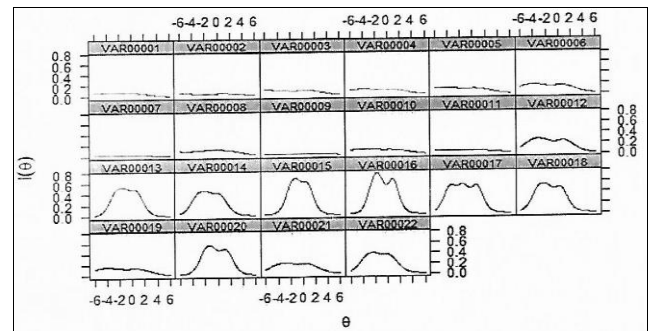
The calculated chi square values were compared with the chi square critical values at the degree of freedom of three (3) and 0.05 level of significance which gave 7.82 for all the items. Since the calculated chi square values of all the items are greater than the chi square critical values, the null hypothesis which states that there is no significant difference between the positive and negative items is rejected. This means that there is a significant difference between the positive and negative questionnaire items. This difference might be attributed to negative questions which are usually more difficult to comprehend.

Research Question four: What is the item information function of the students' self-managed learning tool?

Figure 3: The Item information function for the students' self-managed learning tool

The item information function gives a picture of the level of information provided by each item. Every item in figure 3 assesses the underlying unobserved construct. Information is represented by 1 as shown on the vertical side of the graph.

The level of information is plotted against ability, to get the item information function



From the set of item information functions items one (1) to eleven (11), nineteen (19), twenty one (21), twenty three (23), twenty eight (28), thirty one (31), and thirty five (35) to thirty eight (38) did not add much information to the test information function. However, the slopes of items twelve (12) to eighteen (18), twenty (20), twenty two (22), twenty four to twenty seven (27), Twenty nine (29) to thirty two (32), thirty three (33) to thirty four (34), and thirty nine (39) to Forty (40) indicated that they added more information to the test information function.

The overall Kaiser-Meyer-Olkin measure of sampling adequacy (MSA) for the test is 0.76 which shows that the factor adequacy level of students self-regulated learning scale is middling. The result obtained by Dewanti, Hadi, Numan & Ibrahim (2021) [5] yielded an overall sampling adequacy level of 0.783 which seemed to be approximately on the same level with that obtained by the researcher. Zampetakis, Lerakis, Kafetsics and Moustakis (2015) [24] obtained a measure of sampling adequacy (MSA) value of 0.88 while Tan *et al* (2019) had an overall measure of sampling adequacy (MSA) of 0.903 which was considerably greater than that obtained by the researchers. All the values obtained by these researchers are suitable values for factor analysis.

The factor structure showed forty (40) items with three (3) factors whose eigen values were approximately 4.93, 2.97 and 1.63 respectively, and their communality (h^2) was 9.54. Percentage (%) of total variances for square of factors 1, 2, and 3 were 12.33, 7.42, and 4.09 respectively and their percentage (%) communality totalled 23.85. Lastly, percentage (%) of total communality (h^2) for square of factors 1, 2, and 3 were 51.70, 31.13 and 17.17 which gave total sum of 100% for the communality. The first factor accounted for approximately 52% of the total variance. Lambaerts, Engels and Athanasou (2007) also yielded a three-factor structure which was in agreement with that of the researchers. Zampetakis, Lerakis, Kafetsics and Moustakis (2015) [24] extracted three (3) factors with eigen values of 5.38, 3.30, and 1.27 accounting for 26.89, 16:47 and 6.31 of the total variance respectively. The three factors extracted was in agreement with that of the researchers. Zanon, Hutz, Yoo and Hambleton (2016) [25] identified two principal factors that explained 38.4% of total variance. The factor analysis carried out by Dewanti, Hadi, Numan and Ibrahim (2021) [5] extracted only one (1) factor because only one component had an eigen value of 2.512 greater than one (1), hence the four (4) items assessed were loaded under one (1) factor which explained about 62.79% of the total variance, Three factors which accounted for 47.7% of the

variance were extracted by factor analysis in the studies carried out by Tan et-al (2019).

The Cronbach and Ordinal Alpha reliability coefficients obtained by the researchers both gave a value of 0.85. Salehi and Jafari (2005) ^[19] as well as Wali (2016) got a Cronbach alpha reliability coefficient of 0.85 as well. The Cronbach Alpha reliability coefficient obtained by Zampetakis, Lerakis, Kafetsios and Moustakis (2015) ^[24] was 0.87 which was almost the same value obtained by the researchers. The Cronbach alpha reliability coefficient obtained by Dewanti, Hadi, Numan and Ibrahim (2021) ^[5] was 0.796 which was slightly lower than that obtained by the researchers. However, the Cronbach alpha reliability coefficient obtained by Oz and Sen (2018), Erdogan and Senenoglu (2016) ^[6]; Tan, Loh and Zhang (2019), and Adeola (2021) were approximately 0.90 which was also slightly higher than the coefficient obtained by the researchers. All the researchers mentioned above determined the reliability of their measuring instruments using only Cronbach Alpha while the researchers used both Cronbach Alpha and Ordinal Alpha to determine the reliability of students' self-managed learning tool.

There were recommendations based on the findings that:

1. Students should be encouraged by the lecturers to imbibe the habit of managing their learning because it will help them to expand their knowledge academically.
2. Lecturers in Nigerian Universities should use students' self-managed learning instrument as one of the non-cognitive tests in assessing students' learning skills.

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