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Chemistry students' cognitive styles and their conceptual understanding of some Macroscopic, Submicroscopic, and Symbolic Concepts in Delta State

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Abstract.

The major purpose of this study was to determine Chemistry students' cognitive styles and their conceptual understanding of some Macroscopic, Submicroscopic, and Symbolic concepts in Delta State. Three research questions and two hypotheses were raised to give direction to the study. The design adopted for the study is the expost facto adapting the correlational approach. The sample of the study consists of all forty six (46) 400 level students of chemistry in faculty of education and faculty of science in Delta State University of 2020/2021 academic session. The instrument for data collection was the Chemistry Conceptual Understanding and Cognitive Styles Test (ICUCST). The instrument was properly validated and reliability determined before it was used, The data collected were tested using person product moment coefficient and fisher Z test. The findings of the study include; a high percentage of chemistry students of Delta State University falls under the inventor category of the cognitive style., is no significant relationship between chemistry students' cognitive styles and their conceptual understanding of the concepts of acid and base, titration and isomerism and no significant relationship between chemistry students' cognitive styles and their conceptual understanding of the concepts of acid and base, titration and isomerism based on gender. It was therefore concluded that there is no significant relationship between students cognitive styles and their conceptual understanding. Also, students cognitive styles and their conceptual understanding varies with gender and recommended that teachers should use both pictorial and word base materials in teaching students so that students can benefit equally irrespective of their cognitive styles'

Key words: 1. Cognitive styles 2. Conceptual understanding 3. Macroscopic 4. Submicroscopic 5 . Symbolic concepts.

Introduction

One of the aims of education is to acquire knowledge to enable one become useful to ones 'self and the society. For this aim to be achieved, effective learning must occur. There are so many factors that could enhance or hinder one's learning. These factors could be teacher related or students related. One of such student related factor that has been identified is the cognitive style or cognitive preferences. Cognitive style or thinking style according to the online Wikipedia dictionary (2020) is a psychological concept used to describe an individual way of thinking, how he/she perceives and remembers information. Kraska and Harris (2007) define it as an individual's creativity and style of problem solving. To them, style refers to whether a person attempts to solve problems within the existing context (adaptor) or whether a person seeks to find a new way to approach problems (innovators). Kirton (2003) adaptation-innovation theory (KAIT) defines cognitive style as differences in ways individuals' attempts to solve problems. He classified individuals as more adaptive or more innovative according to their scores on the Kirton Adaptive Inventory. To him, the adaptive individuals prefers solving problems that are more structured in nature and they have the mind set of doing things better while the more innovative ones prefers to solve loosed structured problems and they have the mind set of doing things in a different way. One of the views held by people is that a student will benefit more or make more learning progress if he/she has the same cognitive style with the teacher (Anonymous, 2017). This could be due to the fact that such students and teachers will reason and solve problems the same way. The ability to solve problem is of one the most important cognitive processes people possess (Schunk, 2008). Cognitive style is different from cognitive ability because cognitive ability is measured by the use of intelligent tests or aptitude tests. Also, cognitive styles have been described as value differentiated, organizing and controlling variables which cuts across domains. Whereas ability focuses on the level of performances, cognitive styles are more concerned with the manner of performances (Oyakhirome, 2015). She went further to explain that cognitive preferences are parameters to be considered in the assessment of individual's performances or in the evaluation of education process.

There are different types of cognitive styles identified by researchers. Heat (1964) identified four cognitive styles which are: Recall(R) Principal (P): Questioning (Q) and application (A). Recall (R) is acceptance of information without consideration of implication, application or limitation. Principle (P) refers to the acceptance of information because it exemplifies or illuminates a fundamental principle, concept or relationship. Questioning (Q) is critical questioning of information regarding its completeness, generalization or limitation. Application (A) lays emphasis on the usefulness and applicability of information in general social or scientific content. Hudson in Carey (1999) identified convergent and divergent thinkers as cognitive styles. To him, convergent thinkers get information that is relevant to problem solution. They are logical and rational

thinkers, while the divergent thinkers are more creative and subjective in the manner they use in solving problems. They are flexible and reason more on heuristic evidence.

In the assessment of students' performance, cognitive style and conceptual understanding have important role to play. This is because ones cognitive style is reflected in the way one processes information which is also a product of conceptual understanding. Conceptual understanding according to Omary and Chend (2016) is a situation where students grasp ideas in such a way that they can transfer and apply what they have learnt across domains. Eravwoke (2016) defined conceptual understanding as having a deep knowledge of any concept taught and being able to apply such in similar situation over a long period of time. This shows that when student learn effectively, they should be able to transfer the skills learnt in the classrooms to other situations. In the study carried out by Brown and Kane (n.d) they discovered that a school student learnt better when they saw examples of solutions, rather than being given explicit rules.

In an attempt to determine individual's cognitive styles, various dimensional models and measures were identified. One of such is the multi-dimensional models and measures are the Myers-Briggs indicator. For this indicator, Riding (1991) developed a two- dimensional cognitive style instrument called cognitive style analysis (CSA). This instrument is a compiled computer presented test which has the ability to measure students' position on a two orthogonal dimensions. This dimension he called the wholist analytic (W.A) and Verbal Imagery (V.I)). The wholist analytic (W.A) describes how individual organizes and structure information. According to him, the wholist individual holds a global view or overview of information. This connotes that they don't view and understand information from different perspective. For people who fall under this dimension, learning and understanding what is learnt conceptually may be difficult. Riding (1991) explained that an individual who falls under the analytic dimensions tries to understand information bits by bits not just from the global view. In his words "those individuals deconstruct information from different perspective, have different meaning or same meaning from different angles for conceptual understanding of the information. On the other hand, according to Riding (1991), verbal imagery dimension as to do with how information is represented in one's memory during thinking. Verbal information is information represented in words and imagers are information represented with mental pictures. This cognitive style analysis (CSA) developed by Ridding (1991) is broken into 3 sub-tests and they are based on comparison between response times to different types of stimulus items. This instrument was found unreliable according to Kirton (2003) and some other researchers because the instrument is partly reliant on the ability of the respondent and their speed of answering questions. It also measures cognitive style and ability.

Another dimension of the cognitive style instrument is the Bipolar, one dimensional models and measure. This was described as the field dependent –independent model developed by

Witkin (1971). This model identified an individual's perception behavior while distinguishing object figures from the content field in which they see. For this model, two similar instruments were developed: the Embedded Figure Test (EFT) and the Group Embedded Figure Test (GEFT). In both instruments, the content field is a distracting or confusing background. The aim of the instrument was to differentiate between individuals' who falls under the field-independent and field dependent cognitive style categories. According to him, Field –independent people tend to be autonomous (not dependent) in the development of restructuring skills. Restructuring skills are skills required during technical tasks that are not necessarily familiar to the individuals. On the other hand, the field dependent people are less autonomous in the development of interpersonal skills. These two instruments are also limited because they also measure ability.

Another model of cognitive style is the Kirton's model. Kirton (2003) Adoption-innovation-inventory (KIA) is an instrument to measure cognitive style developed by Kirton. In the instrument, respondents are made to rate themselves against thirty-two (33) personality traits. The instrument didn't measure ability since it was developed with unambiguous language and scores are distributed between cognitive styles of high innovative and high adaptation on the A- I continuum.

Also, in an attempt to assess students conceptual understanding, a two tier -diagnostics instruments have been developed by some researchers (Oyakhirome, 2015 and Eravwoke, 2016). These instruments are two-tier diagnostics because reasons for choosing answers for any questions raised are given along side with their answers. A student who has good conceptual understanding of the question raised should be able to give the right answer and the reason for choosing the answer. The ability of a student to have the correct answer and reason should be a product of his/her cognitive style.

Considering the fact that cognitive style looks at the different ways in which individuals processes information it becomes necessary to determine how this affects students learning in chemistry classroom. Chemistry has been described as the central science (Brown, Lemay, Murphy & Woodwork, 2009). This is because its knowledge is required for the study of other science related courses like medicine, engineering and biochemistry e.t.c. For one to be admitted into any tertiary institution to study these science related courses, one must have at least credit pass in chemistry. The effective study of chemistry will lead to the acquisition of national skills required for national development. If chemistry is well taught and learnt student will be good information processors, who will not find it difficult to have conceptual understanding of the concepts taught irrespective of the level of representation that the chemistry concepts falls into. (microscopic, macroscopic and symbolic level). Chemical concepts can be represented at three different levels: macroscopic, microscopic, and symbolic. The microscopic and symbolic representations are taught in lecture, students experience the macroscopic level in the laboratory. Symbolic

representations can often be the bridge between macroscopic and microscopic representations (Thadison, 2011). This is not easily achieved by students. Students on average have difficulty transitioning between representations and understanding how they are connected (Gabel, 1998). The ability to integrate the three representational levels is important in gaining knowledge of chemical concepts such as solution chemistry (Calyk, Ayas, & Ebenezer, 2005).

Johnstone (1993) organized conceptual understanding of chemistry into three separate levels: macroscopic, submicroscopic, and representational (symbolic). The macroscopic understanding of chemistry is the level most often experienced in chemistry laboratory courses, dealing with observable phenomena that can be experienced via the five senses. The macroscopic level is real to the student and is comprised of tangibles. The submicroscopic level involves understanding the particulate nature of matter, including molecular, atomic, and kinetic points of view. The representational level focuses on making sense of and using representations such as chemical symbols. According to Thadison. (2011), students need to be able to connect the three representations in order to achieve meaningful learning.

Since there seems to be a relationship between cognitive styles and conceptual understanding, it therefore becomes necessary to determine students cognitive styles and how they affects their conceptual understandings. Review of literature shows that some studies looked at relationship between cognitive styles and attitudes and how they affects performance (Gerald 2000:Bassy, Umoh, Udida, 2011), cognitive styles and its influence on gender (Kenth, 2011), effects of cognitive styles on conceptual understanding and problem solving skills (Ates & Catalogu 2007, Dereye, Harrison & Temechym, 2013: Oyakarieyme, 2015). None of these studies looked at how student cognitive styles will affect the student knowledge of some Macroscopic, Submicroscopic, and Symbolic concepts **(**Acid-base, titration and Isomerism). This is the gap this study investigated and to filled.

Statement of Problem

One of the most important aims of education is to teach learners how to think reasonably so that they can become experts in problem solving. As a student interacts daily with his environment, problems that need to be solved are encountered from time to time. These problems may be teaching or learning related and school related. The ability to solve these problems constitutes one of the most important skills students should possess. These skills are necessary and are acquired through effective learning of chemical concepts taught in chemistry which are abstract in nature. For a student to solve problems relating to chemistry, the student must be critical in the way he/she processes information and show some sound conceptual understanding of the learnt concepts. Since chemistry classes are made up of students with varying cognitive styles and conceptual understanding, the problem of the study therefore is: is there any relationship between students cognitive styles and their conceptual understanding of Acid-base, titration and Isomerism?

Purpose of the Study

The major purpose of this study was to determine if there is a relationship, between students cognitive styles and their conceptual understanding of the concept of Acid-base, titration and Isomerism and if conceptual understanding is gender based..

Research Questions

1. What are the cognitive styles possess by chemistry students?
2. Is there any relationship between chemistry students' cognitive styles and their conceptual understanding of the concept of Acid-base, titration and Isomerism?
3. Is there a relationship between chemistry students' cognitive styles and their conceptual understanding of the concept of Acid-base, titration and Isomerism base on gender?

Hypotheses

Research questions one will only be answered.

$H_{01:}$ There is no significant relationship between chemistry students' cognitive styles and their conceptual understanding of the concept of Acid-base, titration and Isomerism

$H_{02.}$ There is no significant relationship between chemistry students' cognitive styles and their conceptual understanding of the concept of Acid-base, titration and Isomerism based on gender.

Design for the Study

The design of this study is an expost facto adapting the correlational approach. This design was used because it allows for verification of facts using already existing information or data. The researcher cannot manipulate the variables under study, since the dependent and the independent variables had already occurred. The independent variable is the cognitive styles, the moderating variable is gender and the dependent variable is conceptual understanding.

Population/ Sample for the Study

The population of the study are all 400 level chemistry students of Delta State University, Abraka. The sample of the study consists of all students of chemistry in faculty of education and faculty of science in Delta State University. The sampling technique used is the total emuration since the population size is small.

Instrument for data collection

The instrument for data collection is the Chemistry Conceptual Understanding and Cognitive Styles Test (CCUCST). The Chemistry Conceptual Understanding and Cognitive

Styles Test (ICUCST) is a two-tier instrument made up of three sections. Section A contains questions asked on student's bio-data while section B contains 20 items drawn from some Macroscopic, Submicroscopic, and Symbolic concepts in chemistry. The items on section B were picked from West Africa Examination Council (WAEC) and University Matriculation Examination (UME) questions from 1988-2018 and they were modified. The questions in Section B are multiple choices of one correct answer with three wrong ones and one correct reason for choosing any option with three wrong ones. Each question in section B requires two answers to be chosen by respondent. i.e. the right answer for the options chosen and the right reason for choosing the option. While section C is the Kirton (2003) Adoption-innovation- inventory (KIA) on cognitive preferences adapted and modified. This section is made up of 33 statements on a four point scale of Very Difficulty (VD), Difficulty (D), Very Easy(VE) and Easy (E), from which students are required to make choices from, base on the degree of how it is applicable to them.

Validity and Reliability of the Chemistry Conceptual Understanding Test and (ICUT).

The content and face validity of the section B of the instrument was done using a table of specification which showed that the content areas were rightly represented.

Table of specification
Objectives

Content	**Knowledge 15%**	**Comprehension 25%**	**Application 25%**	**Higher order 35%**	**Total No of items**
Isomerism 50%	1	3	3	3	10
Acids and base 30%	1	1	2	2	6
Titration 20%	1	1	1	1	4
Total	3	5	6	6	20

This instrument was properly validated and reliability determined before it was used. A table of specification was used to ensure that the cognitive domains were rightly represented for the section B part of the instrument. In the determining the content and face validity of the section C part of the instrument, the instrument was given one experts in science Education , one from measurement and evaluation and one from Guidance and counseling alongside the research questions and hypothesis. They all suggested that the

scale should be changed to SA,A,D,SD. And this was done. In the determining the reliability if the instrument, the instrument was administered to twenty four hundred level chemistry students from another school who were not part of the student. The data collected were analyzed. Using Kuder Richardson (k20) formula, the analysis of the data collected on the section B part of the instrument had an r-value of 0.81. and using cronbach Alpha statistical procedure to analyze data from the section C part of the instrument, an r value of 0.75 was gotten. With these values which are above 0.70, the instrument was considered reliable.

Discussion of Results

Research Question One: What are the cognitive styles possess by chemistry students?

In order to identify the cognitive styles possess by chemistry students, the descriptive statistics of frequencies and percentage was used to analyze the data collected as shown in table 1

Table 1: Descriptive statistics of frequencies and percentage showing Chemistry students Cognitive style

Types of cognitive Styles	Frequencies	Percentage
Innovator	36	78.3
Adaptor	10	21.7

Table 1 showed that 36 (78.3%) of the chemistry students falls under the innovative cognitive style while 10 (21.7%) falls under the adaptive cognitive style group. With this, it can be said that most of the chemistry students possesses the innovative cognitive style.

Research question 2: Is there any relationship between chemistry students' cognitive styles and their conceptual understanding of the concepts of acid and base, titration and isomerism?

In order to relationship between chemistry students' cognitive styles and their conceptual understanding of the concepts of acid and base, titration and isomerism Pearson product moment correlation was used to analyze the data collected as shown in table 2

Table 2: Pearson product moment correlation showing relationship between chemistry students' cognitive styles and their conceptual understanding of the concepts studied

	N	r	r^2	%
Cognitive style- Conceptual Understanding	46	-0.14	0.0196	1.96

Table 2 showed that there is a negative relationship between chemistry students' cognitive styles and their conceptual understanding of the concepts of acid and base, titration and isomerism. The strength of the relationship is a very weak one because the r-value of -0.135 is close to zero. The percentage based on the coefficient of determination is 1.96. This shows that only 1.96% of students' conceptual understanding is explained by the cognitive style that they possess. To determine if the relationship is significant, H_{01} was tested using Pearson product moment coefficient statistics as shown in table 3

$H_{01:}$ There is no significant relationship between chemistry students' cognitive styles and their conceptual understanding of the concepts of acid and base, titration and isomerism

Table 3: Pearson product moment correlation showing relationship between chemistry students' cognitive styles and their conceptual understanding of the concepts studied

	N	r	r^2%	sig. (2-tailed)	
Cognitive style- Conceptual Understanding	46	-0.14	0.0196	1.96	0.371

Table 3 showed that the weak negative relationship which exist between chemistry students cognitive style and their conceptual understanding is not significant. This is because the calculated sig. value of 0.371 is higher than the alpha value of 0.05. With this H_{01} which says that there is no significant relationship between chemistry students' cognitive styles and their conceptual understanding of the concepts acid and base, titration and isomerism is retained.

Research question 3:Is there a relationship between chemistry students' cognitive styles and their conceptual understanding of the concepts of acid and base, titration and isomerism base on gender?

To determine if there is a relationship between chemistry students' cognitive styles and their conceptual understanding of the concepts of acid and base, titration and isomerism base on gender, Pearson product moment correlation was used to answer research question 3 as shown in table 4.

Table 4: Pearson product moment correlation showing between chemistry students' cognitive styles and their conceptual understanding of the concepts of acid and base, titration and isomerism base on gender

Cognitive style-sex	**N**	**r**	**r^2**	**%**
Male	20	-0.378	0.143	14.3
Female	26	-0.200	0.040	4.0

Table 4 showed that there is a negative relationship between chemistry students' cognitive styles and their conceptual understanding of the concepts of acid and base, titration and isomerism base on gender. The strength of the relationship is a moderate one

for the male because the r-value of -0.378 is close to 0.5. The percentage based on the coefficient of determination for the male is 14.3. This shows that only 14.3% of male students' conceptual understanding is explained by the cognitive style that they possess. For the females, there is also a negative relationship between their cognitive styles and their conceptual understanding of the concepts of acid and base, titration and isomerism. The strength of the relationship is weak because the r-value of -0.200 is a bit far from 0.5. The percentage based on the coefficient of determination for the female is 4.0. This shows that only 4.0% of their students' conceptual understanding is explained by the cognitive style that they possess. To determine if this observed difference in their relationship is significant, Fisher Z test was used to test H_{02}

H_{02}. There is no significant relationship between chemistry students' cognitive styles and their conceptual understanding of the concepts of acid and base, titration and isomerism based on gender.

Table 5: Fisher Z test showing difference in relationship between chemistry students' cognitive styles and their conceptual understanding of the concepts of acid and base, titration and isomerism based on gender.

Gender	N	r	Zr	Zr_1-Zr_2	Zcal
Male	20	-0.378	0.4001		
				0.1974	0.52
Female	26	-0.200	0.2027		

Table 5 showed that the observed difference in table 4 is significant since the calculate Z value of 0.52 is less than 1.96. This shows that is a significant relationship between chemistry students' cognitive styles and their conceptual understanding of the concepts of acid and base, titration and isomerism based on gender. With this, H_{02} which says that there is no significant relationship between chemistry students' cognitive styles and their conceptual understanding of the concepts of acid and base, titration and isomerism based on gender is rejected.

Discussion of Findings

The essence of attending lectures is to learn, acquire knowledge and be able to apply the acquired knowledge in solving problems. In order to remember this type of knowledge for letter use, one must process the information give. The way the information is process is dependent on the type of cognitive style possess by the person. The first finding of the study showed that most chemistry students of Delta State University fall under the inventor category of the cognitive style. This shows that these set of students solve problems in different ways. That means that they limit themselves to what is given when solving problems. This finding may be due to the availability of the teaching methodology applied in

teaching them. This finding is in agreement with the view of Kirton (2003). He is of the view that innovators look beyond what is given what they given when solving problems and they do this with the aid of innovative technologies. This enables strive and transcend existing paradigms but reverse is the case for innovators.

The second finding of the study showed that that there is no significant relationship between chemistry students' cognitive styles and their conceptual understanding of the concepts acid and base, titration and isomerism. This means that their cognitive styles do not totally influence how they understand information. This finding may be as result of the nature of the study material used by the students and the possession of different cognitive style by students. The type of cognitive style possessed determines how the given information is processed. If the presented materials does not suit the cognitive style, there will be difficulty in understanding the material given and conceptual understanding may be distorted as they tend to manipulate the material mentally to suit their cognitive styles. This finding is in agreement with the finding of kraemer, Hamilton, Messing, DeSantis and Thompson-Schill (2009). Their findings showed that individuals who prefer to adopt a visual cognitive style engages in mental imagery of word-based stimuli and those with verbal style show tendency show tendency to verbally encode stimuli even when presented with pictorial information. And also in agreement with the findings of Ates, and Catalogu. Their findings showed that students conceptual understanding were not statistically related to their cognitive styles.

The last finding of the study showed that there is no significant relationship between chemistry students' cognitive styles and their conceptual understanding of the concepts of acid and base, titration and isomerism based on gender. This result could be as a result of the different preferences exhibited by male and females in solving problems. This finding is in agreement with the findings of Kusumaningsih, Saptura and Aini (2019). Their findings showed that the understanding of mathematics concept of cognitive style of male is better than that of female.

Conclusion and Recommendation

Base on the findings of the study, it can be concluded that most chemistry students of Delta State University falls under the inventor category of the cognitive style and there is no significant relationship between students' cognitive styles and their conceptual understanding. Also, students cognitive styles and their conceptual understanding varies with gender.

As a result of the findings of the study, it was therefore recommended that teachers should use both pictorial and word base materials in teaching students.

References

1. *Ates, S. and Catalogu, E. (2007). The effects of students cognitive styles on conceptual understanding and problem solving skills in introductory mechanics. Research in Science and Technological Education, 25(2), 167-178*
2. *Bassy, S.W., Umoh, G., Udida,L.A. (2011). Cognitive styles, secondary school students attitude and academic performance in chemistry in Akwa Ibom state, Nigeria.*
3. *Calyk, W. Ayas, U. & Ebenezer, K. (2005). In F. C. Thadison. (2011). Investigating macroscopic, submicroscopic, and symbolic connections in a college-level general chemistry laboratory. Ph.d dissertation of The University of Southern Mississippi.*
4. *Dereye, A.K., Harrison,I.A. and Temechym, E.(2013). Do learning styles influence students' understanding of chemistry concepts and academic performance in chemistry? Journal of Educational and Social Research, 3(5),167-172*
5. *Eravwoke, O.U. (2016). Effect of activity based instructional strategy incorporating role analogy on students conceptual understanding and retention of Isomerism. Unpublished Phd thesis of University of Benin, Benin city, Edo State.*
6. *Gabel, D. (1993). Use of the particle nature of matter in developing conceptual understanding. Journal of Chemical Education, 70(3), 193*
7. *Gerald, R.K. (2000). The relationship of attitudes towards science, cognitive style ad self concept to achievement in chemistry at the secondary school level.*
8. *Johnstone, A. H. (1993). The development of chemistry teaching: A changing response to changing demand. Journal of Chemical Education, 70(9), 701-705.*
9. *Kenth, B. (2011). Difference in cognitive styles and learning skills due to gender and area-wise differences. MIER Journal of Educational Studies, Trends and Practices, 1(1),88-100*
10. *Kirton, M.J. (2003). Adaption-Innovation: In the context of diversity and change. New York: Routtledge.*
11. *Kraemer, D.J.M., Rosenberg, L.M., and Thompson-Schill, S.L (2009). The neural correlates of visual and verbal cognitive styles. Journal of Neuroscience,29,3792-3798*
12. *Kraska, M,.and Harris,S. (2007). Cognitive and teaching styles preference of officers attending the air force reserve officer training instruction course. Journal Of Stem Teacher Education 44(1),6-24.*

13. *Kusumaningsih, W., Saptura, H.A., and Aini, A. (2019). Cognitive style and gender differences in conceptual understanding of mathematics students. Journal of Physics: Conference Series,1-6*
14. *Oyakhirome, A.H. (2015). Chemistry student-teachers cognitive preferences, attitude and conceptual understanding of Matter in Edo and Delta States, an Unpublished Ph.D Thesis, University of Benin, Benin City, Nigeria.*
15. *Riding, R. (1991). Cognitive style analysis. Birmingham: Learning and training technology.*
16. *Thadison. F. C. (2011). Investigating macroscopic, submicroscopic, and symbolic connections in a college-level general chemistry laboratory.Ph.d dissertation of The University of Southern Mississippi.*
17. *Witkin, H.A., Moore, C.A., Good enough, D.R.,and Cox, P.W(1997). Field dependent and field independent cognitive styles and their educational implication. Review of Educational Research, 47, 1-64.*