



THE MOTIVE FOR LEARNING CHEMISTRY AMONG FIRST YEAR STUDENTS AT CHALIMBANA UNIVERSITY

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Abstract

This study investigated the motive for learning chemistry among 200 first year students at Chalimbana University. The Chemistry Motivation Questionnaire, adapted from Science Motivation Questionnaire II by Glynn Brickman, Armstrong and Taasobshirazi (2011) was used to collect the data. The dimensions of motivation measured were intrinsic and extrinsic motivation. The scales used to measure intrinsic motivation were personal relevance and self-efficacy, while career and grade factors were used to measure extrinsic motivation. Version 20 SPSS software was used to analyze the data. Results indicated that learners' motive for learning chemistry was influenced by both intrinsic and extrinsic motivation. Equal numbers of respondents indicated that they were intrinsically or extrinsically motivated.

Key Words: intrinsic motivation, intrinsic motivation, personal relevance

I. INTRODUCTION

Chalimbana University Chemistry Department has been enrolling above 200 students per year the past three years. At first thought the large population meant the liking for the subject. However, the attitude and performance of learners has not been correlating with enrollment. Some students report late for lessons with undone assignments and lack of effort. Researchers sought to investigate the motive for learning chemistry in such large numbers. Hence, the study investigated the motive for learning chemistry among first year chemistry students. Motivation is key to learning among learners (Fong, Jiar & Abu, 2018, Hamoonga, 2017, Munsaka, 2011). The

Center on Education Policy (2012) also argues that it is difficult to improve learners academic achievement, no matter how good the teacher, curriculum, or school is if the students are not motivated.

Sharma and Sharma (2018) define motive as '*what prompts a person to act in a certain way.*' Hence, motivation is the 'reason for people's actions, desires, and needs' (Sharma & Sharma, 2018). Alternatively, Williams and Burden (cited in Dislen, 2017) define motivation as 'a state of cognitive and emotional arousal which leads to conscious decisions to act and gives rise to a period of sustained intellectual and/or physical effort in order to attain a previously set goal or goals'. Glynn, Brickman, Armstrong and Taasobshiraz, (2011) also define motivation as 'an internal state that arouses, directs, and sustains science-learning behavior'. Gambari, Bimpe, Olakanmi & Abalaka (2016) advance that motivation is multifaceted and has many constructs. Glynn et al (2011) state that the constructs of motivation are its types and attributes which include intrinsic motivation, extrinsic motivation (career motivation, grade motivation), self-efficacy, self-determination, assessment anxiety, personal relevance (Glynn, et al (2011), Chow and Yong (2013), Fong et al (2018), and Haapanen et al (2009).

Extrinsic motivation

Extrinsic motivation is the external urge that makes people pursue goals (Munsaka, 2011). Thus extrinsically motivated learners are driven by external factors such as better grades, entry into university, approval by parents and friends, material gain, or to avoid punishment, among others (Munsaka, 2011).

Intrinsic motivation

Intrinsic motivation refers to the internal urge that people have to accomplish a task (Munsaka, 2011). Therefore, learners go to school to satisfy their psychological internal needs. These include competency, enjoyment and interest or pleasure (Froiland, et al 2012), and to satisfy curiosity and love for knowledge (Center on Education Policy, 2012).

Extrinsic or intrinsic motivation among learners

Some proponents for extrinsic motivation argue that grades are a measure of academic success as well as a standard for career entry. Without grades, academic success and career entry requirements would be difficult to measure in the competitive job market (Glynn et al, 2011).

Other proponents argue that extrinsic motivation is faster at changing the behavior of students than intrinsic motivation. They also contend that rewards may be the only way to motivate students to apply themselves to tasks that have no value to them, such as taking standardized test. Some argue that rewards help level the playing field for low-income students whose parents lack the means to offer them incentives for academic success (Center on Education Policy, 2012).

Center on Education Policy (2012) argues that intrinsic motivation has a more lasting and admirable effect on the learner than extrinsic motivation. They reason that when rewards for extrinsically motivated learners are removed, learners may stop working hard. But intrinsically motivated learners keep on working hard for the rest of their lives.

Froiland et al (2012) contend that intrinsically motivated learners are happy, and as such, they exhibit better public relations, and this prevents indiscipline among learners at school. A school that has learners who are in-

intrinsically motivated learners has less number of dropouts than one that has extrinsically motivated learners (Hamoonga, 2017).

Intrinsic motivation develops critical thinking among the learners (Froiland et al, 2012). Learners engage themselves mentally and physically into learning activities by critically interrogating learning materials in order to find out some similarities and differences among the concepts being learnt. This promotes higher order thinking skills among the learners. Intrinsically motivated learners are more focused on school work for a longer period of time than extrinsically motivated learners. The world today is looking for a highly focused workforce which can produce high quality work output.

Intrinsically motivated learners are also independent, critical and creative thinkers (Chow & Yong, 2013) who in adult life become problem solvers whom the world today desperately needs to find solutions to numerous social, economic and scientific problems such as hunger, drought, disease, climate change, pollution and many others. A novel example of a problem is the COVID-19 which needs a solution from the intrinsically motivated scientists, who could arise from intrinsically motivated learners.

Intrinsic motivation makes learners critical of their action (Froiland et al, 2012) as they reflect on everything they do in order to be sure that they are doing the correct thing. Reflection is a very important aspect of our daily lives in order to avoid unnecessary mistakes and accidents. Hence, reflection help us improve our output, and this betters our work culture.

Intrinsic motivation heightens self-efficacy (Burton, 2012; Froiland et al, 2012) which is having self-confidence or the quality to believe in one's ability to perform a certain activity. Learners who are self-motivated usually have strong faith in their capabilities. People who believe in their potential excel in their endeavors.

Intrinsically motivated learners are not only afraid to fail (Froiland et al, 2012), but they don't give up easily, and are always hopeful that they would find the right solution to the problem. They are resilient and perseverant to the stressful condition. These qualities are very important among workers if communities are to develop and need to be developed among our learners who are the workers of tomorrow.

Educational policy on motivational orientation

Government policies on education seem to deliberately promote extrinsic motivation among learners around the world. The Zambian setup could be used to exemplify this scenario. To start with, the type of assessments given to learners determine the motivational orientation that learners develop. There is need to change from assessment of learning to assessment for learning. Assessment of learning makes learners focus on grades, rewards and avoidance of punishment while assessment for learning gives an opportunity for both the teacher and learners to make amends when there are some weaknesses in concept understanding.

Another area of concern is the policy on learner selection after national examinations. The Zambian education system focusses on higher points (Educating our Future, 1996), and not on mastery learning. Learners who get higher marks proceed to the next level of education that breeds an environment of competition among the learners. A practical example is where learners compete for the few university places available in Zambia. This

makes learners focus on grades and not learning for satisfaction or competence. Thus learners do not learn for the sake of knowledge or satisfaction.

School environment on motivation orientation

Sharma and Sharma (2018) argue that the school environment plays an active role in fostering extrinsic motivation among secondary school learners. The author agrees with Sharma and Sharma because, most Zambian secondary schools have set aside a day to celebrate and award some learners for their academic excellence. Learners in these schools are aware of this culture. Hence, it is correct for us to state that most learners are extrinsically motivated.

Learners go to school with different views e.g. to compete with peers to be the best in class, to barely pass and proceed to the next level of education while others go to school because they are forced by their parents. Still, some go to school to run away from house chores and farm work, or to meet friends so that they play. Some learners are told by their parents that education can end their economic problems, hence, they go to school with the belief that one day they would live a better life. Some go to school because they want to be given pocket-money for their breakfast and lunch at school.

Need for study

The end of year examination results for first year chemistry students at Chalimbana University have not been impressive the past three years. Observed also has been negative attitude towards the subject through undone assignments and going late for lessons. Researchers suspected that learners lacked motivation to learn chemistry despite large enrollment numbers. Hence, this study investigated the motive for learning chemistry among first year chemistry students.

3.1 Population and Sample

The target population for the study was 200 chemistry students. And all of them were selected for the study sample in order for the sample to be representative.

3.2 Data and Sources of Data

The 20 questionnaire items were classified into intrinsic and extrinsic motivation. 10 questionnaire items were asked on intrinsic motivation while the other 10 on extrinsic motivation. The percentages of responses (strongly disagree, disagree, agree, not sure agree and strongly agree) for each category were added and divided by 10 since there were 10 questionnaire items for each dimension of motivation. This was done in order to come up with the average response for each dimension of motivation.

3.3 Conceptual and theoretical framework

Figure 1 shows scales of intrinsic and extrinsic motivation. The scales were the constructs measured in this study. Extrinsic motivation was made up of grade and career motivation (Glynn et al (2011) while intrinsic motivation was made of self-efficacy and personal relevance.

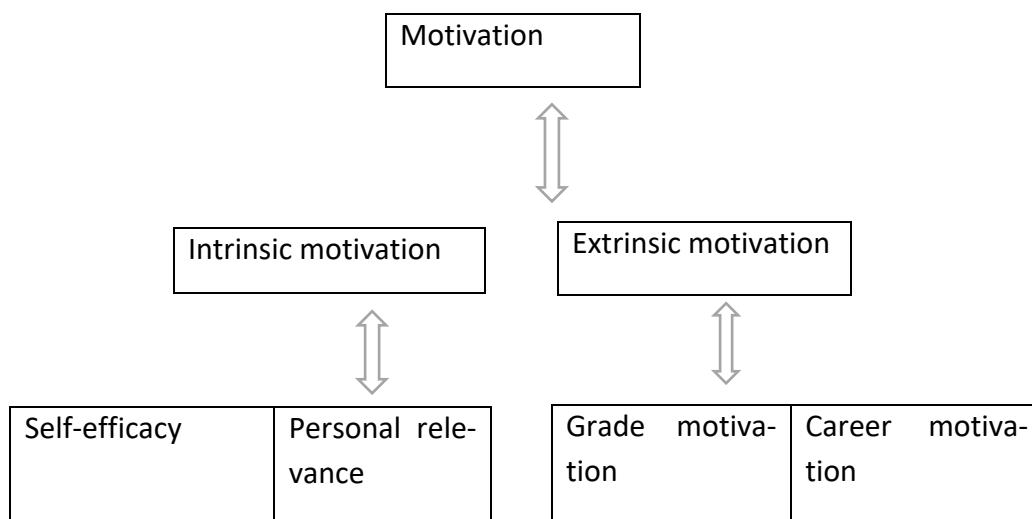


Figure 1: Conceptual framework

Definition of constructs

Motivational orientation refers to the overall reason that drives learners to learn. It may be generalized as either extrinsic or intrinsic motivation.

Self-efficacy is learner's self-appraisal to master the chemistry concepts at senior secondary school level. This may be likened to the self-confidence or self-belief that learners have at learning chemistry. The higher the self-efficacy, the better the learner's cognitive understanding of chemistry. This is an intrinsic motivation.

Personal relevance is synonymous with importance, usefulness, value or meaningfulness of the chemistry learning material. Hence, personal relevance is the perception that students have on the importance of the chemistry concepts. This type of motivation is intrinsic.

Grade motivation is a kind of motivation that drives learners to learning chemistry because they want to get better results in assessments. This is an extrinsic motivation.

Career motivation is a type of motivation that propels learners to learning chemistry in order to have a better paying job. This is an extrinsic motivation.

Review of literature of literature

Motivation is a multidimensional topic. Results from earlier studies showed varied results, perhaps, because of the variations in constructs measured. Glynn et al (2009) studied motivational orientation with college students

using the Science Motivation Questionnaire. The 2009 study classified motivation into self-efficacy, self-determination, intrinsic motivation, extrinsic motivation, personal relevance, and assessment anxiety. The 2011 study subdivided extrinsic motivation into grade motivation and career motivation. Glynn et al (2011) gave the pre-written questionnaire items to students to classify them under the constructs: self-efficacy, self-determination, intrinsic motivation, career motivation, grade motivation, personal relevance, and assessment anxiety. Results from the study were that:

- (a) Intrinsic motivation and personal relevance were clustered together because respondents felt that if science was intrinsically motivating (interesting, enjoyable or pleasurable) it meant that it was personally relevant (valuable, important, useful or meaningful) as well.
- (b) Self-efficacy was paired with assessment anxiety because they felt that if they had self-efficacy (confidence, self-belief) it meant that they were not anxious about assessments.
- (c) Career motivation brought out issues relating to career, such as science is important for my future career, and others.
- (d) Grade motivation included items such as, 'I work hard to be the best in class,' and 'my grade in chemistry matters the most'.

Chow and Yong (2013) studied motivational orientation of secondary school learners towards science, focusing on intrinsic motivation, extrinsic motivation, personal relevance, assessment anxiety, self-efficacy and self-determination. Results indicated that learners had higher levels of extrinsic motivation. Haapanen et al (2009) carried out a study to find out learner motivational orientation in learning science. Majority of the respondents indicated that they were extrinsically motivated. In the same study, Haapanen et al used a Student Goal Sheet to collect data. Majority of learners' goal was to have better grades.

3.3.1 Maslow's hierarchy of needs motivation theory

Maslow's theory teaches that human actions are driven by different needs which can be arranged in a pyramidal hierarch. The lower physiological needs at the base of the pyramid include food, cloths, sleep thirst, etc. which are fundamental to human survival and need to be satisfied before the next higher-order needs. Lecturers may help disadvantaged learners financially or materially sponsoring them and identifying community members and other organizations who may be willing to help them meet to the missing physiological needs of learners. This may help learners be in class and achieve academically.

The second aspect of Maslow's theory is that of 'safety needs' which includes the need for security, protection from danger, freedom from pain, fear and anxiety. Teachers should make classrooms free from hazards such as dangerous chemicals, bacteria, or anything dangerous in the laboratories. Lack of safety may lead to lack of motivation to learning since learners' concentration may be on their safety. Therefore, it is important that learners learn in safe and healthy environment in order for them to actualize their academic aspirations.

Maslow's theory also makes reference to social needs such as affiliation, love and belonging. Human beings are social creatures who need to be loved and accepted by others. A learner who is loved, happy and comfortable may work well in class and actualize their academic dreams. Hence, learners must always feel welcomed and loved by educators and peers in order to realize their academic pursuits. This, therefore, means that the teacher must always establish an environment that permits satisfaction of social needs.

The fourth stage of Maslow's theory is human's desire for self-esteem which includes the need for self-respect or a feeling of importance and recognition. This means that all learners must be treated with dignity as human beings regardless of their race, ethnic extraction, tribe, religious, political affiliation, gender, sexual orientation or physical appearance. If a learner is ridiculed, they may develop negative feelings about themselves and this would lower their self-esteem, resulting in loss of academic interest.

Self-esteem is the urge that human beings have for self-respect, importance and recognition by others (Burton, 2012). Learners who believe that they are important, worthy, respected and recognized have a positive mind and tend to do well in their learning activities. Hence, lecturers must promote warm relations among the learners and themselves. During the teaching-learning process, learners sometimes give unexpectedly poor answers. This may agitate the teacher so much so that they may shout at them. If learners are handled in this manner, they begin feeling that they are not worthy, and they start fearing participating. Lastly they may develop 'learned helplessness' or 'self-fulfilling prophecy' that they are not able to succeed no matter how much effort they put in. Therefore, lecturers must not ridicule the learners when they give out unreasonable responses (Froiland et al 2012).

Recognition is viewed as a key driver of motivation among the human race (Burton, 2012). For example, a learner who participates very much in class activities may be thanked for their contributions. Such learners may act as role models among the friends, and it is expected that many of them would emulate that learner (Burton, 2012).

3.3.2 Weimer's attribution theory

Lecturers must make learners understand that intelligence is not fixed entity, but it is 'malleable' or 'changeable' (Sharma & Sharma, 2018). To do this, a lecturer should attribute learners' success to their intellectual abilities. When learners realize that they have the ability to do well they become motivated and begin putting more effort, and spend more time doing their academic work. Learners would also begin improving their self-esteem and self-efficacy.

3.3.3 Bruner's process of education

Bruner (1960) suggests that learner motivation should emanate from the learning material itself. This means that the lecturer must make the learning process enjoyable to the learners which eventually triggers intrinsic motivation to learning. Educating Our Future (1996) suggests that educators must consider using discovery and experiential learning approaches to make the learning processes meaningful and enjoyable. They can do this through group experiments while the educator scaffolds slow learners. Scaffolding may involve breaking complex concepts into simpler ones which can be easily assimilated by learners. Doing this allows learners to analyze, synthesize and evaluate the ideas under study to 'see' how ideas are related to each other. Experiential and discovery learning helps learners maximize their conception through use of varied senses. For example, they may use sight to see writings on the chalkboard, hearing to hear the teacher speak, and sense of feeling to manipulate science apparatus and chemicals. Through discussions and experimentations curiosity and interest are aroused. Hence, intrinsic motivation may be aroused.

Bruner (1960) also admonishes educators to deliver the learning material in an 'intellectually honest manner' by structuring the concepts in a way that would make learners grasp the concepts with ease. For example, a lecturer may start with basic or foundational ideas before advancing to new, broader and complex concepts. Basic or foundational ideas are concepts which learners learnt earlier in either formal or informal education. They are fundamental to the grasping of the day's learning because they have to interact with the new information for meaningful learning. Put differently, learning must be from known to unknown, simple to complex, and con-

crete to abstract (Ausubel, 1963). This would intrinsically motivate the learners to learn because the seemingly difficult concepts at the beginning are in some way laid bare by the teacher.

3.4 Research Methodology

The Science Motivation Questionnaire II modified by Glynn, Brickman, Armstrong and Taasobshirazi (2011) from the Science Motivation Questionnaire was adapted to form the Chemistry Motivation Questionnaire for this study. The motivational constructs measured in this study were self-efficacy and personal relevance for intrinsic motivation, and grade and career for extrinsic motivation. 5 items were asked on each motivational orientation, making a total of 20 items. The 20 questionnaire items were classified into intrinsic and extrinsic motivation. 10 questionnaire items were asked on intrinsic motivation while the other 10 on extrinsic motivation. The percentages of responses (strongly disagree, disagree, agree, not sure agree and strongly agree) for each category were added and divided by 10 since there were 10 questionnaire items for each dimension of motivation. This was done in order to come up with the average response for each dimension of motivation. The average responses were on each scale and each motivation dimension were analysed to further understand the type of motivation learners had.

4. Results and Discussion

Data analysis was done by using version 20 of the SPSS software. Table 4.1 shows responses of respondents on the questionnaire. The 20 questionnaire items were classified into intrinsic and extrinsic motivation. 10 questionnaire items were asked on intrinsic motivation while the other 10 on extrinsic motivation. The percentages of responses (strongly disagree, disagree, agree, not sure agree and strongly agree) for each category were added and divided by 10 since there were 10 questionnaire items for each dimension of motivation. This was done in order to come up with the average response for each dimension of motivation. For intrinsic motivation dimension, 36.0% of the respondents indicated that they were intrinsically motivated, 22.3% were not sure while 49.9% disagreed with intrinsic motivation. On the 10 questionnaire items on extrinsic motivation (75.9%) of respondents indicated that they were extrinsically motivated, 8.4% were not sure while 13.4% did not agree with the extrinsic motivation. Generally, results show that students at this learning institution are extrinsically motivated. This means that students value their prospective careers, good grades and completion in class more than learning chemistry for the sake of knowledge. These results have implications on the methodology lecturers of chemistry use during lessons. Lecturers may as well intrinsically motivate learners by making the lessons interesting to learners through experiential and discovery learning so that learners can have hands-on activities.

4.1 Results of Descriptive Statics of Study Variables

Table 4.1: Responses of respondents (numbers and percentages)

S/ No	Questionnaire item	Intrinsic motivation [Number of respondents & percentages (%)]					Extrinsic motivation [Number of respondents & percentages (%)]				
		Strongly dis- agree	Disagree	Not sure	Agree	Strongly agree	Strongly dis- agree	Disagree	Not sure	Agree	Strongly agree
1	The chemistry I learn is relevant to my life	1 (0.5)	12 (6)	20 (10)	160 (80)	7 (3.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
2	I like to do better than other students on chemistry tests	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	7 (3.5)	13 (6.5)	49 (24.5)	131 (65.5)
3	Learning chemistry is interesting	4 (2)	133 (66.5)	36 (18)	20 (10)	7 (3.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
4	I believe I can master chemistry knowledge and skills	46 (23)	18 (9)	50 (25)	86 (43)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
5	Learning chemistry will help me get a good job	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	5 (2.5)	95 (47.5)	100 (50)
6	It is important that I get a distinction in chemistry	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	37 (18.5)	23 (11.5)	89 (44.5)	51 (25.5)
7	I am confident I will do well on chemistry tests	54 (27)	68 (34.5)	18 (9)	60 (30)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
8	Knowing chemistry will give me a career	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	40 (20)	11 (5.5)	61 (30.5)	88 (44)
9	Learning chemistry makes my life more satisfying	12 (6)	39 (19.5)	86 (43)	63 (31.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
10	Understanding chemistry will benefit my career	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3 (1.5)	17 (8.5)	60 (30)	120 (60)
11	I am confident I will do well on chemistry practical test	27 (13.5)	38 (19)	53 (26.5)	65 (32.5)	17 (8.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
12	I know about discoveries in chemistry	12 (6)	54 (27)	71 (35.5)	63 (31.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
13	I believe I can earn a distinction in chemistry	60 (30)	48 (24)	23 (11.5)	22 (11)	47 (23.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
14	I enjoy learning chemistry	50 (25)	70 (35)	33 (16.5)	27 (13.5)	20 (10)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
15	I worry about the grade I will get in chemistry	86 (46)	56 (28)	12 (6)	20 (10)	26 (13)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
16	I am sure I can understand chemistry	42	67	43	46	2	0	0	0	0	0

		(21)	(33.5)	(21.5)	(23)	(1)	(0)	(0)	(0)	(0)	(0)
17	My career will involving chemistry	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	18 (9)	34 (17)	37 (18.5)	85 (42.5)	26 (13)
18	Scoring high on chemistry tests is my target	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	11 (5.5)	15 (7.5)	30 (15)	144 (72)
19	I will use chemistry knowledge in my career	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	40 (20)	64 (32)	22 (11)	70 (35)	4 (2)
20	Getting a good grade in chemistry is important	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	7 (3.5)	6 (3)	24 (12)	90 (45)	73 (36.5)
Total		39.4 (19.7)	60.3 (30.2)	44.5 (22.3)	61.7 30.8	13 (6)	6.5 (3.3)	20.2 (10.1)	16.7 (8.4)	62.9 (31.5)	73.7 (44.4)

Discussion, Conclusion and Recommendations

The study was aimed at investigating the motive for learning chemistry. The scales that made up intrinsic motivation were personal relevance and self-efficacy while those that made up extrinsic motivation were career goals and academic grades. It was a cross section case study in form of a survey where a questionnaire was used to gather quantitative data. The study established that learners' motive for learning chemistry was extrinsic for reasons. This means that learners' motive for learning was driven by external factors. There is need by educators to intrinsically motivate the learners because it promotes concentration, deeper learning, life-long learning, and better subject conception, among others.

Acknowledgment

Researchers would like to thank chalimbana university management, especially the Dean, School of Mathematics and Science Education for supporting Research activities in the school.

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Acknowledgment

The authors wish to thank A, B, C. This work was supported in part by a grant from XYZ.

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