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EXPLORING CONSTRUCTIVE LEARNING THROUGH GROUNDED THEORY: EXPERIENCE OF FIRST-YEAR INTERNATIONAL STUDENTS AT A KAZAKHSTANI UNIVERSITY

Abstract

In 2019, one of the universities of Karaganda shifted its status from that of a state to an autonomous research organization entitled as Noncommercial Joint-Stock Organization. Herewith, the university became a research university, which implies that the university allocates significant portion of education programs offer courses that nurture learners' researcher skills. As a result of this reform, in the program of the undergraduate students were introduced new courses related to research.

Purpose: This study aims to provide insights of the first-year international students of a new course via prism of the cognitive learning.

Methods. The current study was designed as a survey study based on grounded theory analysis. As study respondents, 198 first-year international students out of 252 took part in the study. A total of 117 respondents completed a survey with open-ended questions offline, while 81 completed it online after the defense of their project. Data analysis on open, axial and selective coding, four categories that emerged through the prism of Bloom's taxonomy revised by Anderson and Krathwohl (2001) were discussed.

Results. According to research results, designing projects in the first-year of study equips students with the metacognitive knowledge and the cognition skills. There emerged five categories 'new knowledge about the topic,' 'an immersion process,' 'discovery of issues,' 'opening a new Horizon.' These categories indicated accumulation of knowledge and experience through conducting projects. In addition, students' have learned to reflect on examining issues related to their student life. Thus, the study indicates that students' level of cognition transitioned from the procedural to metacognition level.

Key words: constructivist grounded theory, international students, project design, revised Bloom's Taxonomy.

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ИЗУЧЕНИЕ КОНСТРУКТИВНОГО ОБУЧЕНИЯ ПОСРЕДСТВОМ ОБОСНОВАННОЙ ТЕОРИИ: ОПЫТ ИНОСТРАННЫХ СТУДЕНТОВ ПЕРВОГО КУРСА КАЗАХСТАНСКОГО УНИВЕРСИТЕТА

Аннотация

В 2019 году один из вузов г. Караганды изменил свой статус с государственного на статус автономной научной организации с наименованием «Некоммерческая акционерная организация». При этом университет стал исследовательским университетом, что означает, что университет выделяет значительную часть образовательных программ, предлагая курсы, которые прививают и развивают у учащихся исследовательские навыки. В результате этой реформы в программу бакалавриата были введены новые курсы, связанные с исследованиями.

Цель данной работы направлена на исследование изучения нового курса иностранными студентами через призму когнитивного обучения.

Методы. Настоящее исследование было разработано как анкетное исследование, основанное на анализе обоснованной теории. В качестве респондентов в исследовании приняли участие 198 иностранных студентов первого курса из 252. Всего 117 респондентов прошли опрос с открытыми вопросами офлайн, а 81 — онлайн после защиты своего проекта. Анализ данных, выявил четыре категорий, которые возникли согласно открытому, аксиальному и выборочному кодированию, и обсуждались через призму таксономии Блума, пересмотренная Андерсоном и Кратволь (2001).

Результаты. Согласно результатам исследования, подготовка проектов на первом курсе вооружает студентов мета-когнитивными знаниями и навыками познания. Появилось четыре категорий «новые знания по теме», «процесс погружения», «обнаружение проблем», «открытие нового горизонта». Эти категорий обозначали накопление знаний и опыта посредством ведения проектов. Кроме того, студенты научились размышлять над изучением вопросов, связанных с их студенческой жизнью. Таким образом, исследование свидетельствует о переходе уровня познания студентов с процессуального на уровень мета-познания.

Ключевые слова: конструктивистская обоснованная теория, иностранные студенты, дизайн проекта, пересмотренная таксономия Блума.

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НЕГІЗДЕЛГЕН ТЕОРИЯ АРҚЫЛЫ КОНСТРУКТИВТІ ОҚЫТУДЫ ЗЕРТТЕУ: ҚАЗАҚСТАН УНИВЕРСИТЕТІНДЕГІ БІРІНШІ КУРС ХАЛЫҚАРАЛЫҚ СТУДЕНТТЕРІНІҢ ТӘЖІРИБЕСІ

Аңдатпа

2019 жылы Қарағанды университеттерінің бірі өзінің мәртебесін мемлекеттік статустан Коммерциялық емес акционерлік ұйым деп аталатын автономды ғылыми ұйымға ауыстырды. Сонымен, университет зерттеу университетіне айналды, бұл университет білім беру бағдарламаларының маңызды бөлігін студенттердің зерттеушілік дағдыларын қалыптастыратын курстарды ұсынатынын білдіреді. Осы реформаның нәтижесінде бакалавриат бағдарламасына ғылыми зерттеулермен байланысты жаңа курстар енгізілді.

Мақсаты. Бұл жұмыстың мақсаты когнитивті оқыту призмасы арқылы, жаңа курстың халықаралық студенттерімен қалай оқығандығын зерттеуге бағытталған.

Әдістер. Аталған зерттеу, негізделген теориялық талдау арқылы сауалнамалық зерттеу ретінде жасалған. Зерттеу респонденттері ретінде, барлығы 252 бірінші курстың 198-і студенті қатысты. Оның ішінде 117 респондент офлайн режимінде ашық сұрақтары бар сауалнаманы толтырса, 81-і өз

жобаларын қорғағаннан кейін оны онлайн режимінде толтырды. Ашық, аксиалды және селективті кодтау бойынша деректерді талдау, Андерсон мен Кратволь (2001) өңдеген Блум таксономиясының призмасы арқылы пайда болған төрт категория талқыланды.

Қорытынды. Зерттеу нәтижелеріне сәйкес, бірінші курста жобаларды дайындау студенттерді метатанымдық біліммен және танымдық дағдылармен қаруландырады. «Тақырып бойынша жаңа білім», «Сүңгуір үрдісі», «Мәселелерді ашу», «Жаңа көкжиек» төрт категориясы пайда болды. Бұл санаттар жобаларды жүргізу арқылы білім мен тәжірибенің жинақталуын көрсетті. Сонымен қатар, студенттер өздерінің студенттік өміріне қатысты мәселелерді қарастыруды үйренді. Осылайша, зерттеу студенттердің таным деңгейі процедуралық деңгейден метатанымдық деңгейге ауысқанын көрсетеді.

Түйін сөздер: конструктивистік негізделген теория, халықаралық студенттер, жоба дизайны, қайта қаралған Блум таксономиясы.

Introduction Delivering Education programs based on State Compulsory Education Standards have been inherited by Kazakhstani universities from the former Soviet time. Since independence, inner social, economic and political changes required fundamental revision of the education system [1;2]. Consequently, it led to gradual alterations in the education system via adoption of ordinances at the Governmental level. For example, according to the State Program on Education Development in the Republic of Kazakhstan for 2011-2020, in 2019 the autonomy of Kazakhstani universities expected to be expanded [3]. Indeed, this expectation deliberated some activities of universities that were constrained earlier [4;5].

In 2019 Kazakhstani universities transited to develop Education programs through keeping limited number of compulsory courses within it. In particular, an autonomy has been expanded 80% in bachelor, 85% in Master's and 95% in PhD programs [6]. Since this is a new experience to universities, this study conducted to explore students' experiences of a new course in the frame of a renewed Education Program at one of the universities in Kazakhstan.

The design of a new course to facilitate projects was based on previously practiced activity. The first pilot experience of project-based learning was launched in 2018 at one of the universities in Kazakhstan. It was piloted among 36 second-year students by a faculty during their Philosophy course. Students conducted their projects in the frame of students' individual work (hereinafter-SIW) outside class time. They presented and defended their projects before faculty members and representatives of the university's administrative members. Moreover, the results of this experience were presented at the International Conference on Educational Research & Innovation in the USA in 2019 to receive feedback from international colleagues and educational experts. Hence, this was an opportunity to shape a newly introduced course.

The aim of a novice course was to equip students with the necessary skills to design a research project. Herewith, students were lectured on how to define research topic; to conduct a literature review; to design an informed consent form, an interview protocol, and survey and interview questions; to collect data, in particular, interviewing their peers and conducting a survey; to analyze accumulated data through coding; and finally, to present their research to colleagues from the university's Ethics Committee and top managers, as well as faculty members in various departments.

Students were required to conduct their project work in group. In the context where teacher-centeredness yet dominated and ingrained historically, students' attitude toward each other and their work was obvious. In other words, responsible one or two take the major pull meanwhile some named by researchers as *'chal'yvsh'iki'* [translated from Russian as freeloaders] could do nothing, as a result students' contribution to group work remain unequal [7]. Indeed, we, as faculty members were familiar with their typical behavior working in a team. That being said, we have constructed tasks in a way that an individual contribution was unavoidable. Consequently, this paper aimed to investigate students' understanding of the procedures involved in a project design at the individual level. Hence, the research question is *How do first-year international students reflect to own learning within conducting research*?

Conceptualizing project-based learning According to Kokotsaki, Menzies and Wiggins (2016) Project based Learning (PBL) is a constructivist approach of learning informed by three principles i.e., learning as context specific, involves learners actively and through social interaction, learners share knowledge and understanding [8]. The following quote by Fleming (2000;9) summarizes the features of PBL [9]:

Six desirable features of project learning are the authenticity of the problem and the intended product, academic rigor, applied learning that is grounded in the context of life and work beyond school walls, active exploration by students, adult connections that make adults and their work more visible to students, and

assessment practices that include the use of clear criteria and student choice is an important aspect of project work.

While PBL is thought to influence student content understanding and develop their skills, Aksela & Haotainen (2019) contents that the teachers' ability to execute PBL is very important otherwise its benefits could be severely compromised [10]. According to Thomas (2000) the success of the application of PBL depends on the extent to which teachers involve students in identifying a problem, designing a problem-solving strategy, process of investigation and giving the students freedom to achieve the goals of the project independently [11]. While Thomas recognises that PBL has fundamental common features, a caution is made that PBL has been conceptualised differently in different contexts. PBL occurs within the framework of constructivist paradigm.

Project-based Learning and Constructivism Project-based learning entails the constructivist approach as learners build knowledge themselves by being involved in an in-depth investigation of real-life issues. In this respect, a discussion of the theory of constructivism and constructionism is important as far as they relate to PBL. There are differences between constructivism and constructionism by Ackermann (2001) [12]. Ackermann draws on Piaget and Papert 's conceptions of the former and the latter, for instance, according to Piaget constructivism refers to the accumulation of knowledge through inner dialogue, whereas in Papert's understanding, constructionism is built through communication with the external world [12]. Despite this delineation between the two concepts, the author states that in constructing knowledge both approaches are vital [12]. Hence, knowledge construction takes place when an intrinsic interest in learning is closely interrelated to an extrinsic life.

Similarly, parallels are drawn between Piaget's and Vygotsky's theories of constructivism. For instance, Sjøberg (2007) postulates that Piaget's theory is oriented towards how an individual accumulates knowledge and develops an understanding about their surroundings [13]. His theory examined how a child learns and builds knowledge from birth until the age of 12 and above [13]. Moreover, in this individual approach, learning takes place through the active interaction with the external objective world. In contrast, Vygotsky's theory of constructivism refers to the building of knowledge via the influence of the environment and interaction of people with each other. According to him, knowledge takes place when a person is engaged and takes part in daily life issues [13]. Therefore, this is important as this study seeks to explore how students build knowledge about a particular problem through its investigation.

Application of Project-based Learning Discussions among some scholars show that prior to launching the constructivism approach, a faculty member needs to have clarity about the theory and how it supports their learning process, otherwise, the sought for modifications needed to achieve positive results might not materialize. For example, in Taiwan an application of constructivism by inexperienced researchers in the delivery of mathematics curriculum from 1993 to 2003 failed due to a lack of clarity about the concept of constructivism and its application among teachers [14]. This assertion is evidenced by Powell & Kalina (2009) who aver that both approaches of constructivism could serve for students as far as faculty members could manage its core ideas [15].

Furthermore, in the application of the constructivist approach students need to interact with other students. This interaction occurs in what Vygotsky calls the *zone of proximal development* which is when an individual develops an understanding related to their surrounding through communication with others. In their work Jones and Brader-Araje (2002) suggest that in a quest to ensure high level of interaction among students, the application of diverse active methods of teaching is necessary to enrich students' experiences of interaction with their peers [16]. Therefore, the constructivist approach requires the employment of different activities to diversify students' interactions.

On the same token, it must be born in mind that constructing knowledge also requires setting, the process, and the tools that are used within the process. According to Roth (1993), an engagement in diverse fields i.e., ontology, epistemology and methodology is necessary to achieve the construction of knowledge [17]. This implies that teachers observe students' ways of constructing knowledge, reflect on their experiences, and then take action to change their in-class experiences. Hence, teachers' involvement through constant observation and reflection on students' practices is essential in delivering their lessons via the constructive approach.

One way to reflect on students' learning is to discuss their progress with them. Despite peer learning taking place, students' understanding of core ideas may be jeopardized. To avoid such situations, alongside observation, students should be required to render a brief comment about their progress. For example, in a study conducted by Abdulwahed et al. (2009), faculty members' divided project tasks into sub-tasks and

students were asked to provide feedback [18]. The authors found that providing such feedback improves the quality of the completed task by students despite their previous learning differences. Hence, employing the constructivist approach in project-based learning increases the chances of students learning deeply regardless of their background experiences.

Students' motivation in learning facilitates the construction of knowledge. The reason for this is that students' interest in learning triggered inside-out. Daniel Pink in his book Drive (2009) provided a myriad of examples about inner flow that can motivate a person without any additional incentives [19]. In other words, one can be inspired by own interest. Before the publication of this book, a study conducted over two years at Korean schools by Seok and Yager (2004) found that allowing students to choose their own topic for a project resulted in an increase of their interest in learning [20]. Therefore, affording students the opportunity to align their research with issues from reality augments their motivation to learn.

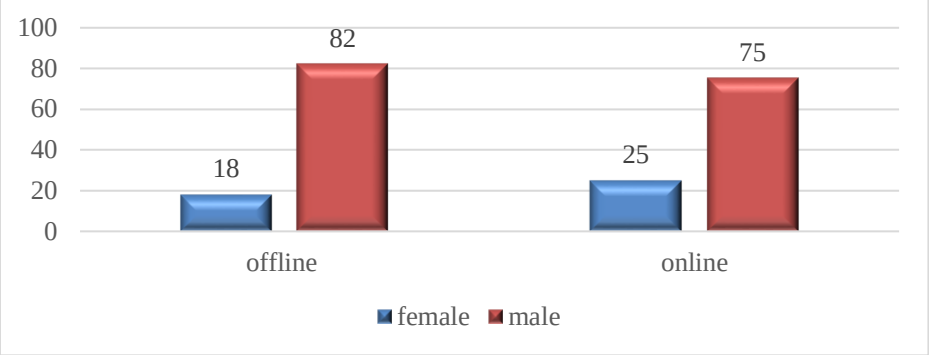
To sum up, the constructivist approach requires the well-preparedness of faculty members in terms of defining its core concept. In addition, it requires faculty members to be equipped with diverse teaching and learning methods to facilitate peer learning. Moreover, it requires the constant observation of students' progress throughout their learning process. This reduces the gap between the prior learning experiences of students. it is clear that to construct knowledge, a student's motivation is significant. In light of this, students' interests need to be prioritized.

Methodology Research Design This is a survey designed study based on grounded theory analysis. The survey design used to investigate views and behaviors, attitudes of a population toward a certain phenomenon [21]. However, survey questions were developed open-ended as it allowed to learn about students' perspectives rather than receiving confirmations to subjectively defined assumptions. Grounded theory analysis was used to investigate and interpret students' responses in order to uncover their construction of knowledge. Debates among scholars, underlines existence of diverse approaches in grounded theory [22]. However, they all agree in certain points related to conducting grounded theory. For example, (a) grounded theory collects data constantly by coding it from the first data;(b) it requires keeping and writing memos while collecting data; (c) data is collected until it reaches a theory saturation (22:3). Data analysis in grounded theory contains initial (open) coding that systematize first raw material, then action (axial) coding aligns data to build a comprehension and selective (focus) coding serves to build a theory through merging all categories [23]. Hence, this study employs data analysis approach of grounded theory as survey consisted of open-ended questions.

Sampling In this study, 198 (78%) first-year international students out of 252 took part. A total of 117 (46%) respondents completed a survey with open-ended questions offline, while 81 (32%) completed it online immediately after the defense of their project. Students were recruited to the survey after the project defense. They were explained about aims of this study and asked to complete the survey. They were explained that their responses will not affect their final grades as they have already completed the course. Students that took the course online were asked to complete survey after the defense, their rights and voluntary participation were indicated in the first page of the google forms survey. This refers that they proceeded to fill the survey being informed about their rights, confidentiality, and anonymity. The link to the survey was send after the course completion.

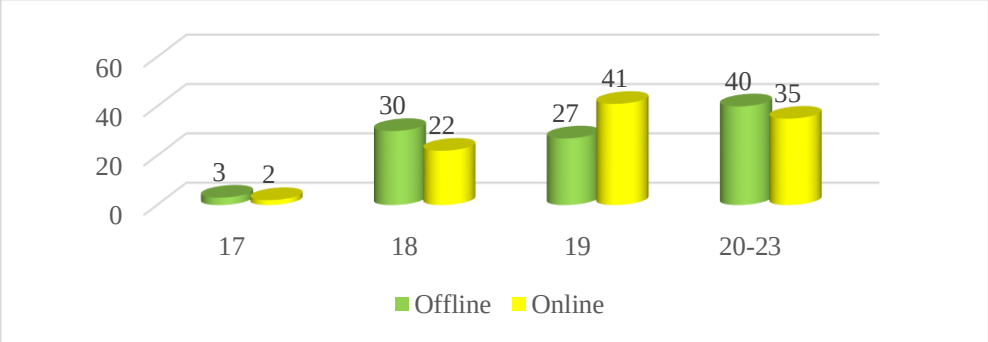
Data Collection Instruments and Process In the study, 198 (78%) students' responses were collected; among them, 117 (46%) submitted their responses on hard copy, while 81 (32%) completed an online survey via google forms. Out of 127, 117 completed the hard-copy survey, and out of 125, 81 completed the survey. The gender ratio of offline participants consisted of 18% female and 82% male students, whereas for online participants, the ratio was 25% female and 75% male students (see Diagram1).

Diagram 1. Gender Proportion in Offline and Online Survey (%)



The age of the participants varied from 17 to 23. The greater proportion, which represented 40% of students in offline studies were between 20 to 23 years of age, whereas in online studies 41% were at the age of 19. However, in both approaches, the least representative were students at the age of 17. This shows the maturity of the students (see Diagram 2).

Diagram 2. Age of Participants (%)



The format of course delivery was undertaken in two ways, offline and online. The first, the offline format was based on face-to-face meetings. Students had the opportunity to discuss their topic in the class and simultaneously employed their knowledge in practice. For example, in the first class, the topic dealt with the formation of a research theme, a research question and research objectives. Based on articles that were provided, students discussed ways to form a research topic, a research question and research objectives with their peers. After discussing this, they, along with their project group members, started to identify their own research topic, question and objectives. The final form of the task as the completion of a PowerPoint presentation. This approach kept students focused and task oriented. In this format they completed all five stages of the project.

The second format, which was conducted online, was quite different. Due to COVID-19 the university had shifted to an online environment. This was unexpected, indeed. Nevertheless, the experience of the offline format was easily adapted to the online one. The most important aspect was a platform where we could meet with students on a regular basis. The university provided us with access to the Platonus platform, where all stages of the project were divided into five tasks. Some tasks were designed differently. For example, if in the offline format students discussed the topic, then formed their own, in the online format students wrote reflections to related articles. Another difference was that while offline, students conducted research in a group, in the online format, they did so individually. Indeed, the online format caused a lot of additional work for faculty members. We provided feedback to students every week, and this involved the revision of 125 tasks submitted weekly.

In addition, in both formats, the time allocated to complete the project was 20 days, or in academic terms, 20 hours. Out of these 20 hours, 10 were allocated to lectures, so 10 remained for practical classes. In our academic time-table, we have 10 hours allocated for Students' Individual Work with a Teacher (hereinafter-SIWT) which envisages individual consultations for students, or office hours. In an ideal

situation, students can come to a consultation when they think they need it; however, due to a lack of time for task completions and the complexity of the project design, we used this time with students to discuss details of their projects.

It is worth mentioning that this the first project assigned to students in their first-year of study. Although they are only 17 to 23 years old, they were required to demonstrate an individual capacity as well as team working skills. Moreover, they had limited time to complete their project, and they had other medical classes to prepare for every day. Despite these challenges, the students were able to produce solid work. They all submitted a portfolio where their contributions to each task were proved by the completed work therein. For example, in completing a literature review, each student was asked to prepare a mind map for their own article. Additionally, in research ethics, each student had to develop three interview questions and two survey questions. Moreover, they were asked to recruit five students for their data collection and have informed consent forms signed these recruits. For their data analysis, they coded the transcripts of their interviews and surveys with open-ended questions.

Data Analysis The diverse answers provided by students were analyzed via axial coding, which helped to examine one particular issue by integrating other categories [24] as in this study, key ideas were merged into categories and aligned to explore students' experiences of constructing knowledge. Another approach used in the analysis was the constant comparison of data [25], which leads to the interpretation of data to build a theory. However, due to experience of these students insufficient to generate overarching theory, this study employed the constructivist approach of grounded theory [26]. It keeps original grounded theory elements such as comparing data, receiving data from the ground, and open-ended questioning [26]. This implies that we have followed the original grounded theory analysis within analysis of open-ended responses of students. We formed categories, subcategories and merged responses into themes. Nevertheless, our context is different across the world, consequently it requires considering uniqueness. As a result, it seeks to examine knowledge in a particular situation rather than creating an overarching theory [26]. Hence, this study utilized the constructive approach of grounded theory to analyze students' experience of constructing knowledge through the development of projects.

Limitation of the Study The limitation of this study is that it was conducted on a very small scale. In particular, it was conducted among only first-year international students. Nevertheless, this experience could be employed in other Kazakh and Russian medium group students and examine how students have constructed knowledge.

This study will be helpful for faculty members that are interested in the experiences of international students. They have their own cultural attitude and approach to learning that sometimes facilitate and the same time create obstacles to their work. Students' experiences could be explored further in their second-year as this course will be continued in the other courses.

In face-to-face learning, although the students were divided into groups, there were certain tasks that they were required to conduct individually. Hence, each student interviewed three students and collected surveys from these three students. Respondents were recruited from the second cohort students that were as yet unfamiliar with the research.

Ethical Considerations Students were recruited to the study right after the course completion. This was convenient as after those students will not come to the department. Taking into account this situation, at the end of the course 15 minutes before the break students were explained the aim of the study and significance of their experiences to other faculty members and students. They were shown the survey to read. Those that are felt comfortable to respond to questions responded and returned back, those who are not comfortable just returned unfilled survey back. They have completed the survey anonymously. After surveys were collected, the pack of surveys were just numbered according to the order that were received from students. Hence, participants' names were coded into numbers; however, their sex and age were indicated, for example, student_1, male_18, and their group number was excluded from the analysis. By following this process, we protected our participants from being identified throughout the discussion.

There were two issues related to ethics at the early stage of the project. First, the students chose a topic related to their current experiences in Karaganda (Kazakhstan). They were allowed to form any topic related to issues that they face with accommodation, and on-campus and off-campus life. Although they explained that they needed to read articles to support their study, they listed all the issues that they face in the literature review section.

Second, this experience emerged during the data collection stage. The students prepared informed consent forms together with their peers. To ensure that all students conducted their interviews, as a result of

task completion, they were required to submit their transcripts and interview records. In the process, a discrepancy between the audio-recorder and transcripts provided by students emerged. Here, the students wrote a summary of what they had heard and added additional information that they needed. There were also cases where students had prepared desired responses in advance and had the interviewee read it into a recorder. This was clear due the text being from the internet and sometimes the interviewees having difficulties reading the hand written responses. In such situations, students were asked to re-take the interview to help us see the differences in the responses and the natural flow of the conversation.

Trustworthiness of the Study In order to maintain trustworthiness, this study employed methodological triangulation [27]. Although the study use survey as a main instrument, the data obtained from open-ended responses analyzed by grounded theory approach. In addition, during analysis data from class observation and presentation of final projects was utilized as well.

Research findings The findings are presented in five major themes. Each theme consists of categories and subcategories. These are: (a)"New Knowledge about the Topic" contains four categories and three subcategories; (b)"An Immersion Process" entails four categories and four subcategories; (c)"Discovery of Issue" maintain three categories and three subcategories; (d)"Opening a New Horizon" and (e)"Knowledge and Experience" have emerged from dominant responses.

The first question of the survey was for the respondent to describe their experience in two words. As can be seen, from the word cloud, the most frequently used words chosen by the face-to-face group were "knowledge, skills, experience, good, and communication (see Figure 1)," whereas online students' responses were "good, knowledge, idea, experience, and interesting (see Figure 2)." Despite the differences in the mode of learning, students believed that they gained knowledge.

Figure 1. The Word Cloud from Offline Course Responses

Figure 2. A Word Cloud from Online Course Responses

The remaining four questions were related to their understanding of conducting research. In order to avoid asking direct questions, students were asked to formulate their praxis in their own words, for instance, to describe their experience of working with the literature review, data collection and analysis, and project presentation. For offline students, out of these four tasks, the data collection was manifested individually,

while the remaining tasks were conducted in a group. For online students all tasks were required to conduct individually.

The second question examined students' understanding of the literature review. Based on our analysis, students' responses were combined into four categories. The first category was *knowledge* where students explained that by reading articles, authors and researchers, they obtained knowledge about their topic. The second category was *Google Scholar* where students explained a mechanical step as identifying key words and reading abstracts to find related articles to their study. The third category was *feelings* where students provided their feelings through words such as "tough, interesting, fun, good, difficult, first experience, amazing." Finally, the category *definition/summary* was the step where students wrote a summary of their article, and some students provided a definition of the literature review. The frequency of students' responses and extracts from their answers are provided in the tables (see Table 1 and Table 2).

Table 1. Frequency of Categories in Students' Responses on Conducting the Literature Review

Categories	Offline		Online	
	Frequency	%	Frequency	%
Knowledge	47	40	33	41
Google Scholar	17	15	2	2
Feelings	17	15	29	36
Definition/Summary	36	30	17	21
Total	117		81	

Table 2. Extracts from Students' Responses on Conducting the Literature Review

Categories	Offline	Online
Knowledge	LR was the main things that helped us to continue and made the core of our presentation. We read many articles, discussed with our groupmates and concluded them to a result. It was quite interesting (Student_111_Female_19_offline)	Literature review is a whole explanation or a type of article on the topic which make it easy to understand the topic (Student_24_Male_19_online)
Google Scholar	I visit google scholar and searched my topic and read the topic by key words after I selected (Student_100_Male_18_offline)	It was easy to find it on google scholar (Student_21_Male_22_online)
Feelings	I found too tough (Student_43_Male_19_offline)	It is very hard-working because this is my 1st time. But really this experience is amazing (Student_64_Male_19_online)

Students' experiences were categorized as "new knowledge about the topic." According to the students' responses, we can see that they referred to Google Scholar as a reliable source for searching for information. In addition, students indicated its significance for their research. Overall, the students' responses indicate that they understood the purpose of the literature review in their research. Nevertheless, our observation of students' work on presenting key ideas from their article showed that they still lacked experience in identifying the main idea of the article.

The third question investigated students' experiences with data collection. In both approaches' students conducted their interviews individually. Four categories emerged from students' responses. The first category, *emotions,* entails their feelings arising from excitement and challenges, for instance, interesting, fun, full of enjoyment, good, nice, tough experience, and hard work. This implies that students referred to the process of interviewing and conducting surveys as attuning them to certain feelings. The second category was *obtaining information.* Here, students considered the process as a way of accumulating information for their study/topic. The third category *rational approach*, had students briefly stating that they had conducted survey and interviews. The final one was *challenges* whereby students indicated the difficulties they faced while collecting data. How these categories emerged and extracts from students' voices are provided in Tables 3 and 4 (see Table 3 and 4).

Table 3. Frequency of Categories in Students' Responses on Conducting Data Collection

Categories	Offline		Online	
	Frequency	%	Frequency	%
Emotions	38	33	46	57
Obtaining Information	23	20	16	20
Rational approach	45	39	14	17
Challenges	9	8	5	6
Total	115*		81	

*2- students did not responded to this question

Table 4. Extracts from Students' Responses on Conducting Data Collection

Categories	Offline	Online
Emotions	excellent, different examples from number of students (Student_90_Male_18_offline)	It was very interesting and adventures, in this I have taken 3 interviews, 2 surveys and 5 consent form (Student_4_Female_17_online)
Obtaining Information	by conducting interviews, surveys through which I also came to know about their views about several problems (Student_72_Male_20_offline)	Take experience of people on own research topic. (Student_18_Male_19_online)
Rational approach	through taking interviews from international students (Student_44_Male_20_offline)	I took surveys (Student_55_Female_19_online)
Challenges	when we collect data, I find many difficulties because of language gap. But overall, my experience was very good (Student_38_Female_17_offline)	Little bit difficult to talk and make them agreed for survey and interview (Student_21_Male_22_online)

Based on these categories, students' experience of data collection was termed "an immersion process" whereby according to their psychological aptitude they perceived the task in diverse manners. This have been drawn from students' progress from an emotional to rational engagement to the process. For example, in the category's emotions, obtaining information, and challenges, we can see engagement of students in the process of understanding. In contrast, in the rational approach, it is difficult to see students' emotional engagement. Their responses establish the fact that they have accomplished a certain task. This could be done merely for the sake of a task completion as well. Nevertheless, students' final products demonstrated that they had developed a basic understanding with regards to the data collection.

The fourth question was allocated to data analysis. It is worth mentioning that students were given only a limited amount of time to thoroughly complete this task, which impacted the quality of their data analysis. They were required to prepare transcripts to interviews, and then to code both survey and interview transcripts. According to their responses, three categories emerged. The most prevalent one was student's own interpretation of their activities titled as "experiences." The next one was "feelings" as students expressed their joyfulness and excitement. Finally, the least representative one was "challenges."

Table 5. Frequency of Categories in Students' Responses on Conducting Data Analysis

Categories	Offline		Online	
	Frequency	%	Frequency	%
Experiences	98	84	51	63
Feelings	12	10	25	31
Challenges	7	6	5	6
Total	117		81	

Table 6. Extracts from Students' Responses on Conducting Data Analyses

Categories	Offline	Online
Experiences	I came to know about the problems faced by international students (Student_81_Female_19_offline)	To analyze the material that I have collected has showed me different ideas and I got to know many new things. (Student_23_Female_19_online)
Feelings	data analysis helps in analysing problems faced by us. Our experience was enjoyable as after collecting data analysis was interesting (Student_116_Female_18_offline)	Excellent☐ (Student_15_Male_18_online)
Challenges	Data analysis was difficult because we have to use statistics, numbers. Overall, it was interesting (Student_51_Male_20_offline)	Dificult but it was entertaining (Student_21_Male_22_online)

Despite the challenges they faced, students were able to manage their data analysis. They described their experiences from various standpoints through the use of charts, statistics, numbers, and the converging data of group members, as referred to their interview and survey results. In addition, students stated that they explored problems faced by students related to their topic. Moreover, students' emotional engagement indicates their deep involvement in examining their topic. Hence, this category was titled as "discovery of issues." This implies that students' experiences go beyond the simple praxis of conducting data analysis and move towards an examination of the issues embedded in their daily life, thereby discovering truths.

The fifth question sought to explain students' impressions following the defense of their project. In this category almost all responses contain feelings such as "exciting, interesting, encouraging, good, amazing, excellent, happy." These feelings were described as "gained new knowledge; experience; confidence; public speaking skills." As a result, these impressions of the students were categorized as "opening a new horizon."

Discussion An in-depth investigation of the categories indicates students' cognitive learning and the metacognitive knowledge skills. The six elements of the cognitive process and the four knowledge dimensions were discussed according to the revised Bloom's taxonomy by Anderson and Krathwohl (2001) [28]. Students' responses were extrapolated to the table (see the Table 7 below) in the two-dimension the knowledge and the cognition [29]. Due to this was a new course and students were lack of particular learning strategies to build projects, they were guided by faculty members to address the tasks independently and in group [30]. Each task required from students to apply different strategies of learning, for instance, identifying a topic in group, then searching articles and its analysis independently, collecting data independently and so on [30]. Thus, as it was expected that these steps led students to the self-learning because they could not impose some tasks to their peers [30]. Furthermore, the character of tasks contained the cognitive elements they were required to find articles, to interview their peers, analyze results individually and merge it with the responses of their peers, finally, create a presentation [31]. After presentation students reflected that despite challenges, they have gained a lot in terms of new skills although in their responses they were unsure where they could apply these skills. Nevertheless, these tasks triggered in students the Metacognitive knowledge skills as they started to reflect and to raise the current issues that their peers face in the campus [30]. Moreover, they refer to this as their first experience, that is said accumulation of new learning strategies [30]. Herewith, when the course was launched the aim equipping students with researcher skills was aligned to the activities and learning outcomes [32]. Thus, the Table 7 shows, instead of the course learning objectives, students' experiences in each stage of the project. By this we can see to what extend intended learning objectives were obtained.

In the students' responses on conducting the literature review, we can see the presence of **three** categories out of six of the cognitive process outlined by Anderson and Krathwohl (2001) [28]. The greater

portion of responses **47 (40%)** offline and **33 (41%)** online were placed in the conceptual knowledge dimension. This indicates students' *understanding* of the procedure of conducting the literature review, its importance to their own study, and how to identify key words and search for relevant articles. The following category "definition/summary" occupied **36 (30%) of the** offline and **17 (21%)** of the online portion of responses. This category refers to the *remembering* and *applying* skills of the factual knowledge dimension as students provided a definition of a literature review and aligned a main idea of the article to their study. The next category 'feelings' took **17 (15%)** offline and **29 (36%)** online responses. It shows students' emotional challenges within the *application* of the process. Thus, correspondingly it was placed in the factual knowledge dimension. Finally, the least representative responses **17 (15%)** offline and **2 (2%)** online were referring to reliable sources such as Google scholar. This shows that students were able *to remember and apply* their comprehension skills in practice to search for an article. Hence, in this task **40%** and **41%** of responses demonstrate the *conceptual* knowledge dimension with the cognitive category of *understanding* whereas remained responses refer to *factual* knowledge dimension with the cognitive category of *application* of the task.

The analysis of students' responses on data collection revealed five out of six domains of the cognition process. The category "rational approach" entails **45 (39%)** offline and **14 (17%)** online responses where students indicated their mechanical completion of the task, which shows students *understanding* of data collection processes and *applying* these processes in practice. The category "emotions" represented **38 (35%)** offline and **46 (57%)** online responses. In this category, students shared their feelings during the data collection process. In addition to this, the category "challenges" provides a discussion of the issues faced by students. In both cases students reflected on their praxes and expressed their experience at the emotional level. Thus, in this regard, these two categories were interpreted as *analyzing* the situation. Finally, **23 (20%)** offline and **16 (20%)** online responses indicate that students were engaged in the data accumulation process to explore their topic thus implying that students *evaluate* and *create* knowledge based on the information they have gathered. Due to this process characterized by conducting research, interviewing and surveying respondents, all cognitive domains were placed in the *procedural knowledge* dimension.

Regarding the responses of the students on data analysis only three categories emerged. The larger portion of these categories was allocated to "experience," which represented **98 (84%)** offline and **51 (63%)** online responses. This category entails the diverse opinion of students regarding how they coded, and then identified issues, and subsequently merged their data with that of their peers, and finally, how they created one table/chart or diagram. This indicates presence of the cognition elements as the *understanding*, *applying*, *evaluating* and *creating*. In addition, the students referred to the feelings and challenges that they faced while conducting the data analysis. These categories represented **12 (10%)** offline and **25 (31%)** online responses and **7 (6%)** offline and **5 (6%)** online responses respectively. Students reflecting on their experiences and emotionally engaging with the process shows their *analytical* skills. In this process students learned to work with raw responses of their peers and to create a story about their challenges, therefore, their responses were placed in the *conceptual* knowledge dimension.

In the Table 7 we can see a final concept of knowledge construction as examined through grounded theory analysis (see Table 3). According to Charmaz's (2009) constructivist approach in grounded theory, the contextual discussion of the five major categories that emerged show how students have been involved in knowledge construction through designing projects [26]. Primarily, students supported their study by reading other scholars' work; then they interviewed international students; after that, they analyzed their data to explore the truths; ultimately, taking these steps helped them to grow and explore knowledge. Hence, these steps explain students' conclusion through two words consisting of "knowledge" and "experience." Moreover, an in-depth investigation of each category revealed that in the students' responses comprise all domains of the cognition process and the factual, the conceptual and the procedural knowledge dimension. Within the process of undertaking projects students heard and analyzed the voices of their peers. This allowed them to reflect on the situation from an objective standpoint. As a result, this activity signals that their level of knowledge shifted from the procedural knowledge to the metacognition according to Anderson and Krathwohl's (2001) cognition taxonomy [28].

Table 7. Students' Self-Perceptions of Learning Outcomes

The Knowledge dimension	1.Remember	2.Understand	3.Apply	4.Analyze	5.Evaluate	6.Create
A.Factual knowledge	Task 2. Literature search 15%*/2%**	Task 2. Literature search 30%*/21%**	Task 2. Literature search 30%*/21%** Task 2. Literature search 15%*/2%** Task 2. Literature search 15%*/36%**			
B.Conceptual knowledge		Task 2. Literature search 40%*/41%** Task 4. Data analysis 84%*/63%**	Task 4. Data analysis 84%*/ 63%**	Task 4. Data analysis 10%*/ 31%**	Task 4. Data analysis 84%*/ 63%**	Task 4. Data analysis 84%*/ 63%**
C.Procedural knowledge		Task 3. Data collection 39%*/17%**	Task 3. Data collection 39%*/17 %**	Task 3. Data collection 35%*/57 %**	Task 3. Data collection 20%*/20 %**	Task 3. Data collection 20%*/20 %**
D.Metacognitive knowledge					Task 5. Presentation	Task 5. Presentation

*- offline responses; **- online responses

Table 7. 1 Students' Self-Perceptions of Learning Outcomes

The Knowledge dimension	1.Remember	2.Understand	3.Apply	4.Analyze	5.Evaluate	6.Create
A.Factual knowledge	Task 2. Searching articles	Task 2. Searching articles	Task 2 Searching articles			
B.Conceptual knowledge		Task 2. Searching articles Task 2. Developing survey, interview questions, ICF		Task 4. Data analysis		
C.Procedural knowledge			Task 3. Data collection			
D.Metacognitive knowledge					Task 5. Reflecting to peers' work	Task 5. Preparing presentation and presenting

*Table is created based on Krathwohl's article (2002), p. 216

Conclusion To conclude, the response to the research question *How do first-year international students reflect to own learning within conducting research* is the following. In this study, it was found that in constructive learning, students' learning entails diverse categories of the cognition process and knowledge dimension depending on students previous learning experiences. Students' responses underline that they all demonstrated, to a certain degree, some domains of the cognition process. Yet, the study found that there was nobody who embraced all six domains of the cognition process, which means that the domains were revealed differently in all students. Nevertheless, project-based learning allows students to construct knowledge by examining certain issues whereby within the process, they embrace domains of the cognition, and as a result, extend their level of knowledge from the conceptual and the procedural learning to the metacognitive processes through enriching their learning strategies.

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ТЕМАТИЧЕСКИЙ АНАЛИЗ НАУЧНОЙ ЛИТЕРАТУРЫ, СВЯЗАННОЙ С ФОРМИРОВАНИЕМ ФУНКЦИОНАЛЬНОЙ ГРАМОТНОСТИ ВЫПУСКНИКОВ ВУЗОВ

Аннотация

Актуальность обусловлена тем, что участники глобального общества 21 века должны иметь возможности развития навыков свободного владения технологическими инструментами, создания межкультурных связей с другими, распространения информации для глобальных сообществ, оценивания мультимедийных текстов.

Причины возникновения проблемы данного исследования заключается в трудности получения актуальной информации, в связи с растущим объемом данных, которые в большинстве своем не структурированы. В виде обоснования необходимости *поиска ее решений* в статье рассматривается материалы, опубликованные в период с 1975 г. по 2021 г. на английском языке в базе данных Web of Science от Clarivate Analytics.

Целью исследования является определение основных тематических направлений научного дискурса в области развития функциональной грамотности в высшем образовании и их использование в виде информативной базы для дальнейших исследований по теме.

В *методологии* исследования использован один из методов в области интеллектуального анализа текста – тематическое моделирование, суть которого заключается в процессе автоматической идентификации тем и получения скрытых закономерностей, отображаемых текстовым корпусом.

Тематическое моделирование позволило придать *результатам* статьи большую научную объективность эксплоративному литературному обзору. Визуализация данных показывает, что тема атрибутов и компетенций выпускников актуальна в различных областях, от психологических исследований, управления бизнесом, компьютерной инженерии до клинических и медицинских наук.

Научной новизной исследования является отход от традиционного методологического подхода к проведению тематического обзора научной литературы в пользу использования методов машинного обучения.

Практическая значимость определяется тем, что в контексте нового подхода к литературному обзору, исследование позволит определить основные тематические направления научного дискурса в области развития функциональной грамотности в высшем образовании.