



## DECLARATION

This MSc Thesis is my original work and has not been yet presented to fulfill of the degree at any other university. All sources and materials used for the thesis are duly acknowledged.

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## **Abstract**

Open data and data-driven decision-making have potential value as material for use in learning activities. However, approaches to harnessing this are not well understood or in mainstream use in education. In this research, Mixed research methods (Qualitative and quantitative) have been used as a methodology to explore their rationale for using open data in teaching and the practical challenges of using open data. Research participants have been drawn from four universities, namely Jimma, Mettu, Bonga, and Mizan Tepi Universities. A thematic analysis was conducted to identify patterns and relationships in these open data-based practices that have already emerged. Drawing on this, common approaches and issues are identified, and a conceptual framework to support greater use of open data by educators is described. There were total of 681 (336 academic staff and 345 students) who participated in the study. 506(74.31%) of the participants were male while the rest 175 (25.69%) were female. Out of 681 respondents, 42.31% used open data for teaching and learning activities. 92.6% of the respondents were found to have a positive attitude towards open data and data-driven decision-making. Open data is supposed to engage in an argumentative discourse to acquire knowledge. Some of the major barriers to research identified by the study were the lack of data literacy (85.3%) of the respondents, followed by lack of availability of information (67.2%), awareness (68.23%), technical support (54.3%), and inadequate financial support (51.7%). The study has shown that the overall attitude of open data and data-driven decision-making towards education quality was positive but the practice of the open data in various learning activities was found to be low. The authors recommend that all the stakeholders encourage quality education in their academic pursuits by providing the necessary time and resources needed to perform quality.

Keywords: open data, data-driven decision-making, Higher Education Institution, Quality of Education,

## List of Abbreviations

ANOVA.....	Analysis of Variance
BoU.....	Bonga University
DDDM .....	Data-Driven Decision-Making
EHE .....	Ethiopian Higher Education
ESDP -----	Education Sector Development Programs
GEQIP -----	General Education Quality Improvement Package
HEI .....	Higher Education Institution
JU .....	Jimma University
MeU .....	Mattu University
MoE .....	Ministry of Education
MTU .....	Mizan-Tepi University
NGO.....	Non-Governmental Organization
OER .....	Open Educational Resources
ODI .....	open Data Interface
SPSS .....	Statistical Package for Social Sciences

# CHAPTER ONE

## 1 Introduction

### 1.1. Background of the Study

When open data is frequently brought up, the emphasis is primarily on business opportunities and the numerous advantages that open data holds for the economy and government, especially in terms of fostering business innovation and efficiency gains (Colpaert, 2018). However, additional advantages have also been measured in terms of other dimensions, including societal and environmental ones. Concerning the latter, the focus lies here on the added value that open data brings to democracy by enhancing the transparency of political processes and boosting citizens' participation in local, regional, and/or national decision-making. However, little attention has recently been given to the use of open data in education in developing countries.

In recent years, the importance and impact of open data at the economic, educational, political, and social levels have become clear (Schifter & Kirchgessner, 2014). The term open data” refers to “data that anyone can access, use, and share. Governments, businesses, and individuals can use open data to bring about social, economic, educational, and environmental benefits” (Akanmu & Jamaludin, 2015). Thus, the public sector has played an essential role in creating and publishing open data, incentivizing its use, or establishing regulations and norms.

Data use or open data-based decision-making is a process of systematically analyzing existing data sources within the school, applying outcomes of analyses to innovate teaching, curricula, and school performance, implementing (*e.g.* genuine improvement actions), and evaluating these innovations (Boateng, 2020). Data use, therefore, represents a systematic, structured, iterative, and interpretive social process in which stakeholders such as teachers and school leaders transform data into actionable knowledge to improve school and student performance (Ahmed, 2018).

In the education sector, open data and data-driven decision-making released by governments and educational institutions, as well as by national and international organizations, can support a wide range of interventions, including strategies to improve the quality of education, the design of effective education policies, the creation of educational resources, and the development of the key literacies needed to operate (Sebestyén & Abonyi, 2021).

According to (Colpaert, 2018), open data utilization in education refers to the use of publicly available educational data to inform decision-making and improve the quality of education. This can include data on student achievement, teacher effectiveness, school finance, and other education-related topics. By analyzing and utilizing open data, educators and policymakers can better understand what is working well in schools and where improvements are needed. This can help inform decisions about curriculum, instruction, and school funding, ultimately leading to better educational outcomes for students (Brynjolfsson & McElheran, 2019).

Studies have revealed that the quality of the education system is assured by the quality of the major educational input equipment, such as quality teachers, curriculum, teaching-learning equipment, and facilities, and the quality of the educational process, expressed in the form of good management, appropriate class size, and student-teacher ratio as well as student book ratio. (Education, 2009) has developed and employed the General Education Quality Improvement Package (GEQIP) for the quality improvement of general education. GEQIP is composed of several components and sub-components that contribute a considerable role to the school's effectiveness namely the development of teachers and leaders; curriculum, textbooks, and assessment; planning of school improvement and resource use by schools; the use of information and communications technology; the improvement of school infrastructure and facilities with special attention to the most remote regions, and management and administration program (MoE, 2010).

Our country has reached a progressive level of development in terms of access. However, as success is not accompanied by quality that much, the level of student achievement remains the

most serious challenge and school difficulty that requires more effort and commitment. The gains in access are of little meaning if they are not accompanied by improved student learning (Education, 2009). Studies revealed that implementing a comprehensive program will result in educational benefits including increased student ability, skill achievement, and attainment of educational objectives as well. However, improving quality education is not only confined to employing a variety of programs and the school's operation but also in-school factors have a direct and indirect effect on the quality of teaching and learning and educational attainment: Physical facilities, teaching, school resources, and number of students per class. The focus of quality in education is found in the students admitted, the learning adopted, and the academic staff in the institution.

## **1.2. Statement of the Problem**

From time to time, technological advancement is increasing all over the world. Both developed and developing countries are conducting various studies to improve the quality of their education. The quality of education is the basis for sustainable development and the improvement of livelihoods, as well as crucial for the development of a country. The concept of open data and DDDM has become a "buzz word" in recent years, indicating several diverse but matching technological developments (Matt et al., 2015). Despite success in access to education, there is a decline in quality of education at all levels of education (university, high school, elementary school) in Ethiopia ( Mulu, 2012; Lemma et al., 2014; Gojeh & Worku, 2015).

The recent development in the Ethiopian Education System, among others, the university entrance exam and national exit exam results is very concerning with a pass rate of just about 3% and 62% respectively in 2023. This shows that there is a need to do a holistic intervention.

With the DDDM approach, teachers could focus on formative assessments evaluating their daily ongoing learning as well as the overall achievement that relates to a summative assessment connecting what is known to the students and what we want them to learn. Using DDDM, a shift in traditionally accepted practices could be made to improve teaching and student learning

outcomes. For more than a decade, DDDM principles have been adopted to examine and evaluate teaching practices in the classroom and academic interventions to improve student learning experiences and achievements. However, using data to inform teaching practices is a multifaceted one.

Similarly, studies were centered on exploring factors affecting the quality of higher education. The centrality of education as a core and principal engine for development and nation-building is unquestionable. Quality education is a multi-dimensional education aiming to cultivate students' creative spirits and achieve students' all-around development in morals, intelligence, physical, and aesthetics (Admasu & Desta, 2021).

The quality of education is greatly linked with data and data-driven decision-making. Despite success in access to education, there is a decline in student academic performance at all levels of education (university, high school, elementary school) (Akanmu & Jamaludin, 2015). Contributing factors to the decline of student performance are many, among others: political instability, the economy, and Gojeh and Worku (2015) Lack of open data utilization has a declining effect on quality education and has impacts on student academic performance. The quality of education is assessed by the education levels of teachers, method of teaching, curriculum, and study environment Admasu & Desta, (2021).

Using open data and digital data-driven techniques can enhance student outcomes, *i.e.*, the desired learning objectives or standards that teachers want students to achieve, and the educational, societal, and life effects that result from students being educated and also open up new research avenues for advancing data usage culture (Brynjolfsson & McElheran, 2019). Accordingly, this study was initiated with the main aim of investigating the status of open data utilization in the Ethiopian education system and the effect of a decision approach to improving education quality and attempting to answer the following research questions.

## Research Questions:

1. What is the status of open data utilization to improve quality of education in the Ethiopian higher education system?
2. What is the effect of data-driven decision-making in improving quality of education under the settings of Ethiopia?
3. What are the challenges related to the utilization of open data in higher education in Ethiopia?
4. What kind of framework of open data can help to improve education quality in Ethiopia at higher education levels?

## **1.3 Objectives**

### **1.3.1 General Objective**

The general objective of this study is to investigate the status of open data utilization in the Ethiopian education system and the effect of a Data-driven decision-making approach to improve education quality in Ethiopian higher learning institutions.

### **1.3.2 Specific Objectives**

- ❖ To determine the status of open data utilization in the Ethiopian higher education system.
- ❖ To assess the impact of Data-driven decision-making to improve education quality in Ethiopian higher education.
- ❖ To determine the major challenges that hamper open data usage in the Ethiopian higher education system.
- ❖ To develop a framework of open data utilization to improve education quality in the Ethiopian higher education system.

## **1.4 Scope of the Study**

The main intent of the study is to investigate the utilization of open data and DDDM impacts on education quality for Ethiopian Public higher learning institutions and develop a framework that was not intended to implement it. The study was focused on exploring the current usage of open data and DDDM practice approaches in only four selected Ethiopian Public Higher Learning Institutions (JU, MeU, MTU, and BoU) that are situated in Southwest Ethiopia. The study also limits itself to academic staff and undergraduate students of the four selected universities.

## **1.5 Significance of the Study**

In the 21st century, the usage of open data in the education sector leads to a better learning-teaching process. Evidence-based decision-making in teaching and learning methods improves the quality of education. In the scenario of open data, the education sector needs to have updated and innovated with an adequate proportion of techniques. This study has addressed the use of open data in Ethiopian universities. Secondly, the framework developed by this research will contribute to ensuring the quality of education. In addition, the full and sustained use of open data will improve the quality of higher education in Ethiopia. This study will pave the way for improving education deficiencies and help update all stakeholders by providing up-to-date information on open data. Finally, it is expected that this study will serve as a baseline for future research works in the area.

## **1.6 Operational Definitions**

**Open Data:** is data that is openly accessible, exploitable, editable, and shared by anyone for any purpose (Lutalo et al., 2018).

**Data-driven decision-making (DDDM)** is a system of teaching and management practices that focuses on students' day-to-day learning and overall achievement. It's about connecting what our students know and what we want them to learn. And also a paradigm shift from existing practices

and formerly accepted instructional methods to improving student learner outcomes and achievement (Schifter & Kirchgessner, 2014)

**Ethiopian Public Higher Educational Institutions:** an educational institution that is governed by MOE in the country and delivers the education level beginning from a higher diploma program to a Ph.D. level.

## **CHAPTER TWO**

### **Literature Review**

#### **2.1 An Overview of Open Data**

Open Data is the name given to datasets that have been generated by international organizations, governments, NGOs, and academic researchers, and made freely available online and openly licensed. These datasets can be used by educators as Open Educational Resources (OER) to support different teaching and learning activities, allowing students to gain experience working with the same raw data researchers and policy-makers generate and use. In this way, educators can help students understand how information is generated, processed, analyzed, and interpreted (Akareem & Hossain, 2016).

The goal of Open Data initiatives has been to open all non-personal and non-commercial data, especially data collected and processed by government organizations (Luthfi & Janssen, 2019). Public sector organizations have started making governmental data available on web portals, as web services so that the public has access to such official datasets in one place. The increase in the availability of open data initiatives has been seen mainly due to the growing pressure imposed by governments on all kinds of public organizations to release their raw data.

One of the key purposes of open data platforms is to promote access to government data and encourage the development of creative tools and applications to engage and serve the wider community through the visualization of patterns and relationships (Mandinach, 2012). In doing so, enabling civic engagement by providing opportunities for citizens, public sector organizations, businesses, and independent developers to use a systematically updated stream of open data is being encouraged.

Despite occasional initiatives from the government to encourage the use of open data technologies via events such as hackathons, workshops, and conferences, not much is known about the

predictors that influence people's (i.e. citizens) perceptions, willingness, ability, and intention to use open data technologies. Open data is an emerging field and the acceptance and use of open data technologies has not received much attention in the extant literature (Kim & Lee, 2012).

## **2.2 Education Quality**

Quality of education is a critical element in education policy, according to UNESCO (2000) educational quality is concerned with “improving all aspects of the quality of education and ensuring excellence of all that recognized and measurable learning outcomes are achieved by all, especially in literacy, numeracy, and essential life skills” (Lapi et al., 2012) in this context, there are various definitions of the quality of education notwithstanding quality education includes: Learners who are healthy, well-nourished and ready to participate and learn and supported in learning by their families and communities, Environment s that are health, safe, protective and gender-sensitive, and provide adequate resources and facilities.

Good quality education is measured in terms of outcomes. Which have a positive effect on work productivity, individual incomes, socioeconomic growth, innovation, and rapid learning of new technologies (Zaborova, 2021).

## **2.3. Open Data and Education Landscape**

Open Data has been highlighted as a key to information transparency and scientific advancement. They also provide a meaningful context for gaining experience in educational workflows and processes, as well as learning good practices in data management, analysis, and reporting (Provost & Fawcett, 2013).

Open data used as an open educational resource can allow students to learn and experiment by working with the same raw data researchers and policy-makers generate and use. They can form a key component in research- and scenario-based learning activities, and in supporting students to develop informational, statistical, scientific, media, political, and critical-thinking skills. By working with real-world data, students can develop learning and research skills, and apply

analytical, collaborative, and citizenship skills in using data to solve real-world problems (Akanmu & Jamaludin, 2015).

For students to engage with contemporary social problems, it is key to embed Open Data principles in research-based teaching and learning contexts to provide students with the experience of working with the same raw materials scientists and policy-makers use (Lapi et al., 2012), applying different methodologies in real scenarios and presenting the results in research papers that can be assessed, therefore connecting learning with real-world problems (Luthfi & Janssen, 2019).

**Critical Thinking:** According to (Corrales-Garay et al., 2019), “learners are supposed to engage in an argumentative discourse to acquire knowledge”; therefore, it is necessary to embed creative and innovative approaches in face-to-face, blended, and distance teaching and learning.

**Research Skills:** Open Data can facilitate the education of new researchers; for example, openly available datasets can be used to create games, activities, and resources to promote learning in science education (Schifter & Kirchgessner, 2014). Students should be provided with learning experiences in which they collaborate, analyze information and data, and communicate results effectively and by relating these tasks to specific scientific or social problems (Piedra et al., 2017)

#### **2.4. Data-Driven Decision-Making**

According to (Saddiqa et al., 2021) data-driven decision-making (DDDM) is a system of teaching and management practices that focuses on students’ day-to-day learning and overall achievement. It’s about connecting what students know and what they are expected to learn. It’s about accountability and a paradigm shift from existing practices and formerly accepted instructional methods to improve student learning outcomes and achievement. The principles and practices have been shown to have positive impacts on student learning and achievement. an essential component of educational practice across all levels, from chief state school officers to classroom teachers, and has received unprecedented attention in terms of policy and financial support (Luthfi & Janssen, 2019).

According to Kim & Lee, (2012), DDDM pertains to the systematic collection, analysis, examination, and interpretation of data to inform practice and policy in educational settings. It is a generic process that can be applied in classrooms to improve instruction as well as in administrative and policy settings. It can be applied by teachers, principals, superintendents, other administrators, data entry clerks, chief state school officers, and federal education officials. DDDM crosses all levels of the educational system and uses a variety of data from which decisions can be made (Sebestyén & Abonyi, 2021) These include instructional, administrative, financial, personnel, transportation, welfare, health, demographic, perceptual, behavioral, process, and other kinds of data. So, open data and DDDM have an important role in education to increase emphasis on rigor (Akareem & Hossain, 2016).

## **2.5 Data-Driven Decision-Making Approach in Education**

Data-driven decision-making (DDDM) is a process for deciding on a course of action using data or facts and not by merely using observation, intuition, or any other form of subjectivity that could be biased. The adoption of DDDM is growing in the education sector for making informed improvements when educators use student data to influence curriculum decisions, strategies, and policies (Linton, 2015). With digital technologies becoming more accessible, affordable, and available anywhere and anytime, it has become easier to use data to inform decision-making in teaching and assessment practices.

With the DDDM approach, lecturers could focus on formative assessments evaluating their daily ongoing learning as well as the overall achievement that relates to a summative assessment connecting what is known to the students and what we want them to learn. Using DDDM, a shift in traditionally accepted practices could be made to improve teaching and student learning outcomes. For more than a decade, DDDM principles have been adopted to examine and evaluate teaching practices in the classroom and academic interventions to improve student learning experiences and achievements. However, using data to inform teaching practices is a multifaceted one.

The term data in DDDM refers to information that can be broadly classified as either quantitative or qualitative. This could include information captured intentionally and analyzed at either the individual or group level, such as informal observations of students' classroom behavior, inventories of student learning activities, formal norm-referenced assessments, self-appraisals of students/lecturers, automatic generation of data from an online learning management system, etc. From the literature, we observe that data can be used in multiple ways based on the range of practitioner perspectives that result in the complexity of DDDM for different educational situations. While data could provide more insights into classroom instruction, there are multiple perspectives of the philosophical view of reality, knowledge, and learning (Ahmed, 2018). Further, there are philosophical differences in the purpose and methods of data collection for the intended stakeholders as well as in their levels of involvement.

Some studies have been conducted on a large scale, collecting data from a school, district, or even state to inform classroom practice, assessment paradigms, and student performance. Multiple perspectives surrounding the concept of assessment and its purpose exist. Data could be captured by not only academic staff but also administrators on various attributes related to lecturers, classroom activities, assessments, etc. Any data gathered, whether in numerical format or not, has the potential to influence classroom delivery and ultimately, student learning and achievement. With a new era compelling educators to collect, organize, and analyze data, using the information effectively for instructional and curriculum improvement requires a framework as guidance.

High-level education officials are looking to DDDM as a potential solution to some of education's most pressing problems such as improving the graduation rate, decreasing the dropout rate, and better preparing students for higher education (Lutalo et al., 2018). According to (Akareem & Hossain, 2016), data can provide invaluable information about the learning strengths and weaknesses of students, as well as clues about how to structure instructional strategies to meet those needs. Some educators, however, believe that data are to be used to deal with accountability issues. For administrators, particularly at the district and state levels, data are seen to address

programmatic questions regarding an intervention or curriculum. However, there are many issues around and challenges to DDDM (Schifter & Kirchgessner, 2014).

According to (Mandinach, 2012), the lack of human capacity around DDDM is a challenge that impacts practice more than research. The problem is that teachers and administrators rarely receive systematic training in data-driven practice in their preparation to become educators. There is a dearth of formal courses, specifically on DDDM. Access to good professional development is limited. What is needed is a systemic and comprehensive education program for pre-service and in-service teachers and administrators, with assistance from schools of education, and professional credentialing organizations (Mandinach, 2012). A related issue is that there is no clear agreement about what data literacy is or how it the operationalized. The construct means different things to different people. Some assume it is the same as assessment literacy (Kim & Lee, 2012).

## **2.6 Multiple Perspectives on Data and Assessments**

The descriptions of assessment found in the literature reflect different philosophical views of reality, knowledge, and learning” as well as philosophical differences over “the levels of student and teacher involvement, the methods used to gather information, the purposes or goals of assessment, and the intended audiences for the results” (Akareem & Hossain, 2016). Akareem argues that these philosophical views affect classroom practice because teachers are influenced by their assessment paradigms when they gather and interpret data about student performance. The same argument could easily be applied at the school or district level; therefore, it makes sense to approach a study of data-driven instruction with an overview of the multiple perspectives surrounding the concept of assessment and its purpose.

The Data Analysis Framework for Instructional Decision-Making, designed by (Schifter & Kirchgessner, 2014) also contains three categories: professional development, classroom data, and reading performance data. The first two categories, professional development data, and classroom data, are useful because they enrich our understanding of the information that might be placed in the process data category. Akanmu & Jamaludin, (2015) opined that it helps us reflect upon the

the idea that data serves us in different ways. Data can help us count (outcome data), sort (demographic data), or act (process data).

## **2.7. Related Works**

Schools, as education centers, have been categorically observed as users of data, and studies attending to how to improve data usage by ensuring DDDM for school improvement have been fairly conducted. As observed by Sebestyén & Abonyi, (2021), the core value of DDDM lies in the data management and analytic culture of the educational institutions, by ensuring that the core business values of the institutions and its data structure are always in compliance with the institutions' business goals. The previous studies on Data usage and DDDM in education (Akanmu & Jamaludin, 2015) & (Mandinach & Schildkamp, 2021) took this same path.

Some studies offer models to assist in the conceptualization of the data gathered for using it more effectively (James et al., 2010). Such studies have used three kinds of data, namely, outcome data, demographic data, and process data, and have suggested that a combined use of all three would result in instruction being systematic, targeted, and purposeful with high levels of student learning. Student learning assessments such as classroom tests, exams, and even surveys could be analyzed to get insights about individual and group performance. These, combined with demographic data such as students' age, gender, race/ethnicity, and social class/socioeconomic, status would provide a broader perspective for effective decision-making.

In addition, process data are related to the curriculum organization, teaching strategies, and other classroom management of the educational program. Process data, when analyzed in combination with outcome and demographic data, can result in changes in the behavior of lecturers and administrators (Admasu & Desta, 2021). Along similar lines, the Data Analysis Framework for Instructional Decision-Making proposed by (Luthfi & Janssen, 2019) consists of three categories: professional development data, classroom assessment data, and reading performance data. Both these models help in reflecting that data from the three categories when combined, lead to effective DDDM. However, their data categories do not differentiate between summative and formative

assessments though the conceptual perspectives of different types of assessment vary in purpose and role.

Data from both formative and summative assessments are used to determine the proficiency of a student's learning achievement or performance. These are judged about certain pre-established criteria or in relative comparison to a peer group that serves as the basis for assigning student grades. While data derived from formative assessments could be useful to report on students' learning progress with a focus on their immediate learning needs, data from summative assessments may inform the overall achievement of the learning target or learning objective for the current/future cohort of students and the decisions have high-stakes consequences (James et al., 2010).

With the recent advancements in digital technologies, a plethora of new possibilities have emerged for facilitating assessments to engage students with lifelong experiences. However, the use of digital technologies for assessments is more about replacing traditional methods and existing practices rather than being transformative. Further, the ethical issues of digital technologies in assessment and other factors affecting successful educational change require closer scrutiny, and a DDDM approach could assist in rethinking assessments. However, a recent study by Mandinach & Schildkamp, (2021) explored the misconceptions around data-based decision-making in education among researchers and practitioners.

Based on a survey of the literature, it was identified that the effectiveness of DDDM can be derived based on having reliable data, measurable goals, and the ability to transform data analysis towards improving educational interventions with a focus on professional learning and development. Such related studies could provide a stimulus for implementing justified changes in educational practice as well as a roadmap for a future research agenda on the effective use of data for achieving educational quality and innovation (Mandinach & Schildkamp, 2021)(Kaspi & Venkatraman, 2023).

Their study (Akanmu & Jamaludin, 2015) emphasized the role of open data for evidence-based decision-making in addressing the decision-making challenges of higher education. Their study focused on curriculum design, just as (Saddiqa et al., 2021). However, while (Akanmu & Jamaludin, 2015) focused on how to achieve a curriculum structure that aligned with the employment reality, (Saddiqa et al., 2021) aimed for accreditation and improved ranking. This is similar to those (Schifter & Kirchgessner, 2014), but with a preference for strategic positioning of staff and the institution's research quality. Other education data-focused research is on minority-serving institutions, instructional support for data extraction, professional development, continuing education, and racial and gender equity in admission quota (Luthfi & Janssen, 2019).

According to Gojeh and Worku (2015), on the work of their study which is investigating the effect of Jimma University libraries system usage and contributions to quality Education at Jimma University. To achieve this objective the researchers used used qualitative and quantitative data collection approaches. The result of the study indicated that available library materials, both hard and soft copies were inadequately used by the instructors and students, and the services provided by the library system were found to be less satisfactory for the majority of the respondents implying a negative impact on quality education.

Research conducted by Eyerusalem (2018) investigated the need to transform library management, usage, and its impact on quality education. The study revealed that school libraries in Jimma Zone have inadequate resources, especially electronic resources and facilities or provisions. The finding implies the existing out-of-boundary (beyond students' level) and outdated resources have a weak impact on the quality of education in general.

Most of the previous studies focused mainly on role of open data, digital technology, digitalization effect and challenges on teaching and learning methods, impact of library management usage on education quality. In generally most of the related studies discussed have not explained the open data usage and the effect of DDDM on students' academic performances to improve education quality in Ethiopia. This study therefore intended to investigate the open data usage and the effect

of DDDM on academic performance. Besides, most of the related studies that have been discussed were carried out in developed countries; whereas studies that were carried out in Ethiopia focused on libraries. This study on the investigation of open data usage and the effect of DDDM on academic performance will be done to fill this knowledge gap.

On another hand, students’ performance targets and their rating and improved readiness, instructional improvement, students’ enrolment, retention and attrition, and students’ learning goals are past studies that exclusively dealt with students’ DDDM.

### 2.8. Conceptual Framework

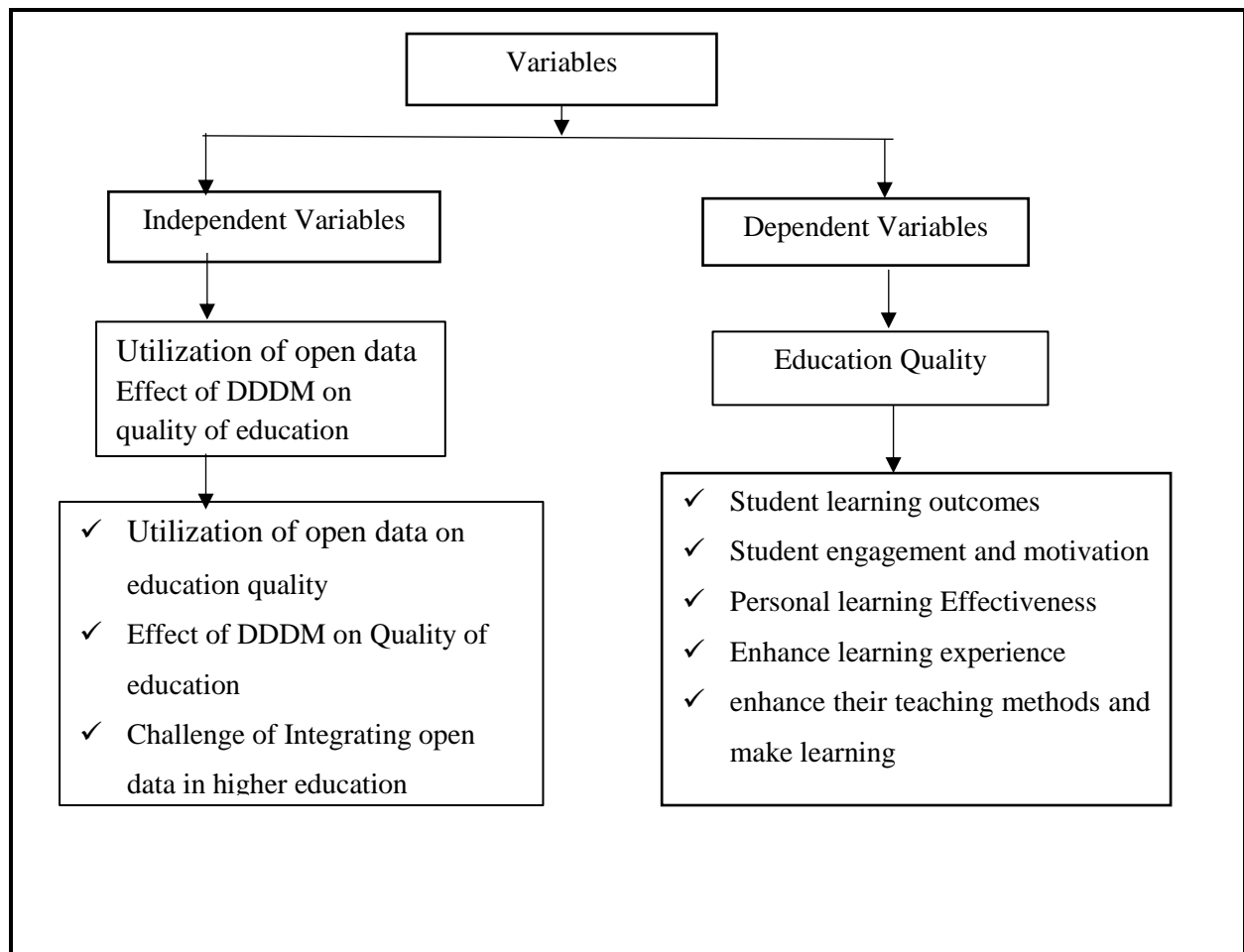


Figure 2.1 Conceptual framework of the study

## **CHAPTER THREE**

### **3 Research Methodology**

#### **3.1 Study Design**

The researcher used mixed methods which employed both quantitative and qualitative research methods to gather adequate and relevant data on the status of open data utilization and DDDM practices. Using mixed research can neutralize or cancel the biases of any single method, and it is used as a means for seeking convergence and integrating qualitative and quantitative data (Creswell, 2009). Questionnaires were used as a quantitative method and interview was used as a qualitative method.

#### **3.2 Study Site**

There are 49 public based on their establishment period. Ten were relatively older and categorized as 1st generation universities established in different parts of Ethiopia that have been authorized by the Ministry of Education. According to annual statistics of the Ministry of Education, all universities are classified into 4 categories, while the remaining 11, 12, and 12 universities were established somewhat later and categorized as 2<sup>nd</sup>, 3<sup>rd</sup>, and 4<sup>th</sup> generations, respectively ([www.aau.edu.et](http://www.aau.edu.et) & [www.aastu.org.et](http://www.aastu.org.et)). The present study was conducted in four selected different-generation universities of Ethiopia, JU (Jimma University) from 1st generation, MU (Metu University) and MTU (Mizan Tepi University) from 3<sup>rd</sup> generation, and BU (Bonga University) from 4<sup>th</sup> generation and all are situated in Southwest Ethiopia.

#### **3.3 Study Population**

The study populations are targeting the JU (Jimma University), MeU (Metu University), MTU (Mizan Tepi University), and BU (Bonga University). According to the Registrar's Office and official website data, the population of each university student and staff are shown in Table 1

Table 3 1 Academic Staff and Student Population of the Study

No	Targeted Universities	Number of academic staff	Number of students
1	Jimma University	1897	42000
2	Metu University	1200	10500
3	MizanTepi University	973	10000
4	Bonga University	500	6758
Total		4570	74258

### 3.4 Sample Technique and Sample Size

#### 3.4.1 Sampling Technique

Purposive sampling refers to targeting a group of respondents believed to be reliable or useful for the study (Loru, 2020). It was mainly used to collect focused information from typical and useful cases. In this study, purposive sampling was used to select the study sites like library directors and IT directors and for interviews that the researcher believed were resourceful for the study. A stratified and simple random sampling technique was used to select samples from students and academic staff. Moreover, individuals to be interviewed were selected based on their responsibility as officeholders. Hence, the researcher interviewed the library director, E-learning Coordinators/ICT Director, and Academic Quality Assurance and Relevance Director of all four universities.

#### 3.4.2 Sample Size Determination

The data was collected by the researcher from four universities: a total of 368 academic staff and a total of 370 students (3<sup>rd</sup> year –graduate students). The sample size was determined by using the statistical formula given below with the appropriate sample size confidence level = 95% and

margin of Error = 5%. Having the population of each university the total sample size was determined using the (Kothari, 2004) formula as follows:

$$n = \frac{n_o}{1 + \frac{n_o}{N}}$$

*(Kothari, 2004)*

n = sample size

x= chi-square for the specific confidence level at one degree of freedom

N = total number of administrative staff

p= population of proportion

d= desired Margin of Error

$\alpha$ = level of significance

The sample size should be:

q = 1-p

Where: d = 0.05

p = 0.5

$\alpha$ =0.05

Based on the formula  $n_o = 385$ .

$$n = \frac{\frac{N_o}{1 + \frac{N_o}{N}}}{1} = 385 \text{ (sample size).}$$

The total academic staff of the selected universities is 4570. By taking the population correction factor into account our sample size will be 368.

Sample size allocation (proportional allocation for JU, MU, MTU, and BU)

$$n_1 = \frac{n \cdot N_1}{N} = n_1 = \frac{n \cdot N_1}{N} = 147 \text{ from Jimma University}$$

$$n_2 = \frac{n \cdot N_2}{N} = 99 \text{ from Mizan Tepi University}$$

$$n_3 = \frac{n \cdot N_3}{N} = 80 \text{ from Mettu University}$$

$$n_4 = \frac{n \cdot N_4}{N} = 42 \text{ from Bonga University}$$

The total number of students for all the selected universities is quite high. The sample size is calculated to be 370 after the population correction factor using the formula and then an equal sample size is allocated for each university:

$$370/4 = 93 \text{ students from each university.}$$

### 3.5 Data Collection Instrument

The instruments used to collect data for this study were questionnaires and interviews. The qualitative data were collected using interviews: for interviews, the respondents are purposively selected. To gain in-depth data about open data utilization and data-driven decision-making practice. Data were collected by using both open-ended and close-ended questions, which were administered to randomly selected respondents from each university. This is because the

questionnaire provides an opportunity for respondents to give frank and anonymous answers if not affected by the presence of the researcher (Loru, 2020). Moreover, the questionnaire has the advantage of enabling respondents to give their opinions independently (Sarantakos, 2003). Qualitative and quantitative approaches (methods) are also used to collect and analyze data.

### **3.6 Data Source**

There were two sources of data which included primary and secondary data. Primary sources were collected from the sample respondents. The questionnaires included several types of questions: nominal, ordinal, and scale items. In nominal-dichotomous items the researcher asked the respondents to categorize them according to their place (university), educational status or work position, and experience.

### **3.7 Method of Data Analysis and Interpretation**

Thematic analysis method was used to analyze qualitative data and all data sources were interpreted during the analysis to complement, and increase validity. This involved cleaning up the data from interviews and the questionnaires, categorizing them into themes and patterns, and making a content analysis to determine the adequacy of the information in terms of credibility, usefulness, and consistency (Julius, 2013). Qualitative data was analyzed by thematizing them, and all data sources were interpreted during the analysis to complement, and increase validity.

The quantitative data gathered was organized, numbered, and coded, then entered using SPSS software version 27. To analyze data, the researcher employs descriptive method and inferential statistics was used to show the face value of the measure of the impact of open data on the quality of higher education the challenges of open data integration in higher education at the selected universities. The quantitative data was described by tables, percentages and charts.

### **3.8 Ethical Consideration**

Ethical issues are important considerations in the design and conduct of research (Harper, 2011). It does not involve people without their knowledge or consent. It keeps the privacy of each participant. All activities in this study were conducted legally. The Institutional Research Board of Jimma Institute of Technology has issued an ethical letter so that this research be conducted. Accordingly, the data and information gathered have been used only for this research and the privacy of the research participants kept confidential.

## SECTION FOUR

### 4 Result and Discussion

#### 4.1 Results

##### 4.1.1 Response Rate

##### Proportion of Respondents and Response Rate

In this study a total of 740 respondents from four public universities (Jimma University, Mattu University, Mizan-Teppi University, and Bonga University) took part.

Table 4.1 below depicts the result of the response rate of the respondents from these four universities. From a total of 740 (100%) questionnaires distributed, 681(92.02%) were properly filled out and returned. The response rate from students was 91.3% and that of academic staff was 92.74% and the overall response rate was 92.02%, which is high enough to proceed with the analysis.

Table 4.1 Result of response rate

No	Name of institution	No of questionnaires					
		Distributed		Collected		Percentage100%	
		Instructor	Student	Instructor	Student	Instructor	Student
1	Jimma University(JU)	143	93	134	88	93.7%	94.6%
2	Mizan Tepi(MTU)	99	93	91	90	91.9%	96.77%

3	Metu University(MeU)	80	93	73	81	92.25%	87.09%
4	Bong University(BU)	40	93	38	86	90.4%	92.4%
<b>Total</b>		368	372	336	345	91.3%	92.74%
<b>Total</b>		740		681		92.02	

#### 4.1.2 Demographic Information

Table 4.2 Gender of the respondents

Gender	Frequency		Percent	
	Instructor	Student	Instructor	Student
Male	292	214	86.9%	62.03%
Female	44	131	13.10%	37.97%

Table 4.2, presents the gender of the study participants. Accordingly for the students out of 345 (100%), 214 (62.03%) were male and the remaining 131 (37.97%) were female, and for the academic staff out of 336 (100%), 292 (86.9%) were male and 44 (13.10) were female. Thus, the result shows that for both students and instructors, male study participants are more than female study participants.

Table 4.3 Staff Academic Qualification

Academic Qualification	Frequency	Percent
Bachelor degree	17	5.06%
Master's Degree	314	93.45%
PhD	5	1.49%

The distribution of respondents depending on the educational levels of the teachers is presented in Table 4.3. Accordingly, the vast majority of the respondents 314 (93.45%) were MSc holders followed by BSc holders and PhD holders, 17 (5.06%) and 5 (1.49%) respectively.

Table 4.4 Students' Year of Study

Academic Year	Frequency	Percent
2 <sup>nd</sup> year	78	22.61%
3 <sup>rd</sup> year	110	31.88%
4 <sup>th</sup> year	157	45.51%

The result on students years of study presented in Table 4.4 shows that 78 (22.61%) were from the second year, 110 (31.88%), and 157 (45.51%) from the third and fourth year. This indicates that the student population under consideration was well informed to give the relevant data needed for this study.

Table 4.5 Departments selected from each university for data collection the students

Department	Frequency	percent
Computer Science	80	23.19%
Accounting	27	7.28%
Mathematics	32	9.83%
Nursing	38	11.01%
Natural Resource Management	66	19.13%
English	48	13.91%
Psychology	54	15.65%
Total	345	100%

Table 4.6 Departments selected from each university for data collection the academic staff population.

Department	Frequency	percent
Computer Science	54	16%
Accounting	58	17.2%
Mathematics	35	10.4%
Nursing	42	12.5%
Natural Resource Management	45	13.3%
English	57	16.9%
Psychology	45	13.3%
Total	336	100%

Table 4.5 and Table 4.6 displays participants' by departments. Accordingly, 54 (16%) teachers and 80 (23.19%) students are from Computer Science; 58 (17.2%) teachers and 27 (7.28%) students are from the Accounting Department; 58 (17.2%) teachers and 32 (9.84%) students are from the Mathematics; 35 (10.4%) Teachers and 38 (11.1%) Students are from the Nursing

Department; 42 (12.5%) teachers and 66 (19.3%) students are in the Natural Resource Management Department; 45 (13.3%) teachers and 48 (13.9%) students are from the English Department; 57 (13.3%) teachers and 54 (15.65%) students are from the Psychology Department, respectively. Thus, the result shows that for both students and instructors, Computer Science, Natural Resource Management, and English departments are more participated in the study than other department participants. (Table 4.5) and (Table 4.6).

#### 4.1.3 Status of Open Data Use

To determine whether the respondents are using open data in their university, different questions were asked and the result is presented in Table 4.7 For the first item, namely if they access or use of national open data portal, only 39.51% of the teachers said yes and the majority, 60.49% said they are not accessing or using. When it comes to the students for this same question, 33.33% said yes and two-thirds (66.67%) said no. The second question “Have you ever contributed your data for public access on your university’s open data portal?” was only for the academic staff only 18.28% of the participants said yes and the vast majority (81.72%) said no. For the question “There is a culture of promoting data usage for the best decision-making”, almost the same percentage of instructors and students said yes, 38.40% and 38.34% respectively. The remaining said no, (Table 4.7).

Table 4.7 Use of open data in the university

No	Item		Yes	No	Mean	Std. dev
1	accessed or used national open data portals	Teachers	39.51%	60.49%	1.6049	.48953
		Students	33.33%	66.67%	1.66	.47
2	Have you ever contributed your data for public access on your university’s open data portal?	Teachers	19.28%	81.72%	1.7771	.41670

3	There is a culture of promoting data usage for the best decision-making	Teachers	38.40%	62.60%	2.114	.3567
		Student	38.34%	62.66%	1.98	.34

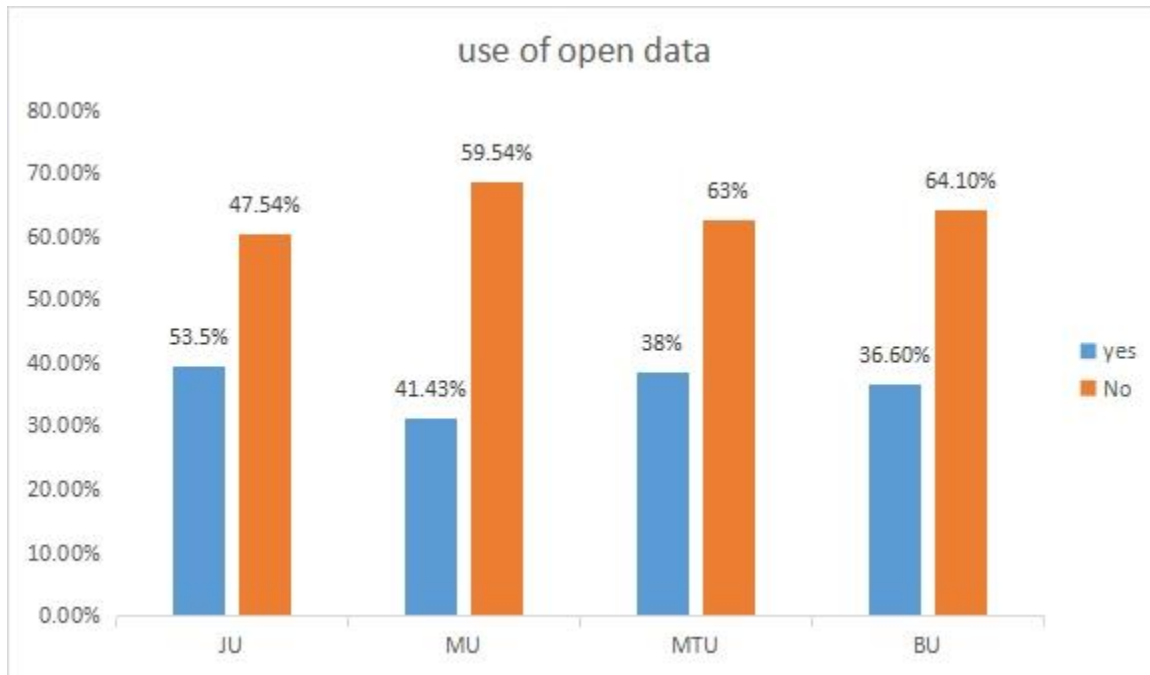


Figure 4.1 Use of university open data in each university

As depicted in Figure 4.1, the result of the analysis revealed that 39.51%, 31.28%, 38%, and 36.60% from JU, MU, MTU, and BU respectively use open data in their respective university. This shows that the majority of the respondents do not use open data, which is 60.49%, 69%, 63%, and 64.10% respectively from JU, MU, MTU, and BU.

The study revealed that the usability and accessibility of openly available digital resources can have a significant positive impact on the quality of education. When students and teachers have access to a wide range of digital resources, including educational websites, online courses, and

software applications, they can access the latest information and technologies to enhance their learning and teaching experiences.(Botelho, 2021) openly available resources can also provide a more personalized learning experience, increasing satisfaction, increasing efficiency, improving the productivity and learning outcomes of students. Allowing students to learn at their own place and in their own style. This can help increase engagement and motivation, leading to better learning outcomes.

#### 4.1.3.1 Intensity of Open Data Use for Educational Tasks

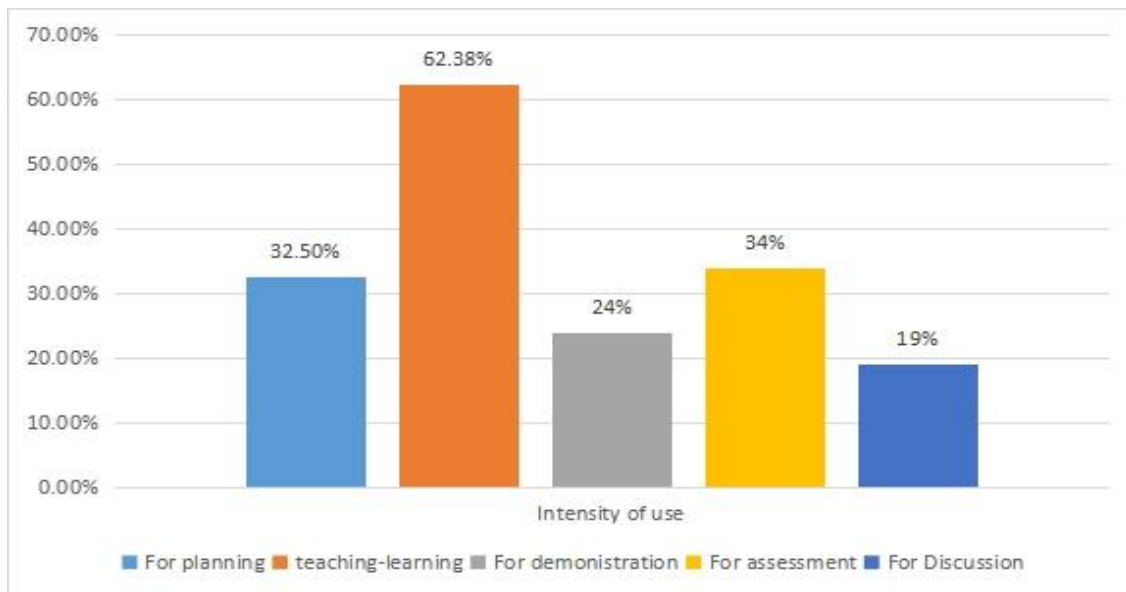


Figure 4.2 Intensity of open data use in the universities

As depicted in Figure 4.2, the result of this study revealed that the majority of the respondents use open data for teaching and learning processes rather than others (62.38%), 34% of respondents used it for assessment and 32.50% used it for planning, and 24% and 19% respondents are used for demonstration and discussion respectively.

#### 4.1.3.2 Open Data Usage Frequency

Table 4.8 Usage Frequency of Open Data by University

	percentage	Mean	Std. Deviation
JU	53.5%	0.565	.432
MU	41.43%	0.45	.33
MTU	38%	0.378	.21
BU	36.60%	0.324	.19

To observe users who used open data for teaching and learning activities and usage differences among universities, the question was asked about the time-frequency of use. The open data usage frequency is somewhat higher in JU compared to other universities, which was 53.5% in JU, followed by Mettu University (41.43%), Mizan Teppi University (38%), and Bonga University (36.60%), (Table 4.8).

Table 4.9 Use of open data for educational task

No	Item	Never	Rerly	somet ime	Often	Very often	Mea n	Std. dev
?	How often do you use open data for the following educational tasks?							
1	Prepare applications or multimedia resources (audio, video, animations...)	2.3%	8.28%	30.1	59.54%	-	1.78	.58
2	Maintain a repository of educational resources for my learning	3.3%	17%	25.7	52.33%	2.9%	1.96	.69

3	Collaborate with students and teachers	5%	12.1%	22.7	51.80%	12.1 %	2.05	.82
4	Communicate with students	6.1%	13.67 %	31.8 %	47.2%	-	2.15	.77
5	For Presentation	2.3%	16.69 %	33.3 %	42.90%	5.03 %	1.88	.843
6	For project work	4.32%	11.81 %	22,7 %	59.47%	-	1.84	.61

Kenate, D., (2004) and Gojeh, et al... (2013), argue that a decision on the respondents ranking of the results (variables), into a percentage, and mean of responses was guided by Likert`s scale: of 1.0 -1.49 very low, 1.5-2.49 low, 2.5- 3.49 medium, 3.5-4.49 high and 4.5 - 4.99 very high.

According to the survey results, respondents used open data for different educational tasks, more of the respondents often used open data to prepare applications or multimedia resources (audio, video, animations...) and educational resources (material) 59.54% and 52.33% with mean value 1.7, 1.9 and Std. dev 0.58, and 0.69 respectively. But some of the respondents are rarely used open data to prepare applications or multimedia resources and educational resources 8.28% and 17%. For presentation preparation and project work 42.90% and 59.47% with mean values of 1.88 and 1.84 respectively. But some of the respondents rarely used open data for presentation preparation and project work 16.69% and 11.81%.

#### **4.1.4 Effect of Data-Driven Decision-Making in Education**

In this research, it was attempted to find out the effect of data-driven decision-making in education. Accordingly, a number of questions were posed to the instructors in all four universities. The result revealed that most respondents said that it has a positive effect even though the mean range is in

the low or medium based on the references cited above. The responses are summarized in table 4.10 below:

Table 4.10 Teachers' Response opinion about the effect of open data use

No	Parameters	SA	A	U	D	SD	Mean	SD
1	There is a culture of promoting data usage for decision-making in your university.	10.33%	22.55%	31.79%	28.80%	6.52%	2.98	1.09
2	DDDM brings improvements in the completeness and quality of educational data	66.14%	23.64%	6.77%	0.54%	1.90%	2.95	1.74
3	DDDM helps to identify academic bottlenecks to required courses with low pass rates	24.73%	64.40%	8.42%	1.9%	0.82%	1.90	.708
4	DM allows for responsive course material improvements	24.46%	59.78%	12.77%	2.17%	0.82%	1.96	.77
5	DDDM directs instructional practices in the classroom; instructional interventions improve student outcomes.	65.78%	30.78%	4.51%	1.36%	0.27%	2.18	1.68

6	DDDM can increase a positive attitude toward data usage.	26.63%	53.53%	19.57%	0.27%	0.11%	1.93	.69
7	DDDM can increase the ability to transform classrooms and lead to dramatic improvements in an educator's responsiveness to students	27.45%	51.36%	18.75%	2.17%	0.27%	1.99	.71

As can be seen from Table 4.10 majority of the respondents (66.14%) strongly agreed that DDDM brings improvements in the completeness and quality of educational data with a mean value of 2.95 and a standard deviation of 1.74. Besides, a good number of the respondents (23.64%) agreed that DDDM. Similarly, for the question “DDDM directs instructional practices in the classroom; instructional interventions improve student outcomes.” 65.78% of the respondents strongly agreed with a mean value of 2.18 and std. dev 1.68. Regarding DDDM has helps to identify academic bottlenecks to required courses with low pass rates, 64.4 per cent of the respondents agreed, 24.7% per cent of the respondents strongly agreed, 8.4% of the respondents not at all. The mean value of the response is .68 SD. dev is available at 1.94.

Regarding timely reporting, 71.9 percent of the respondents said that using DDDM can increase the ability to transform classrooms and lead to dramatic improvements in an educator's responsiveness to students. But 2.1% percent of the respondents are little, 18.7 percent are moderate, 51.3% are agreed, and 27.4% percent are ineffective. The mean value of the responses is 1.9, and SD. dev is 0.7. Consensus DDDM can increase a positive attitude toward data usage for 53.5 percent of the respondents. But 19.5% of the respondents were undecided and 0.27 percent of the respondents disagreed. The mean value of the response is 1.95, and the standard deviation is 0.71.

#### **4.1.5 Challenges of Open Data Utilization**

The findings of Table 4.11 on the respondents' use of open data in their teaching activities reveal that (181) 53.55% of the respondents found it challenging to incorporate these technologies into predetermined teaching activities or lack data literacy. However, 53.55 percent of the respondents were undecided and 3.43% did not agree. With a mean of 2.05 and a standard deviation of 0.78, the data show that teachers found it challenging to incorporate digital technologies into their lesson plans. Lack of availability of information was cited by 51.9% of the respondents as a major obstacle to implementing open data in their organizations, according to the survey results on lack of availability of information about openly available. However, 5.71% of the respondents disagreed and 19.5% said neutral. The standard deviation of this response is 1.07 and its mean value is 3.842. Regarding the lack of a data management system to integrate digital technologies into their teaching practices, 23.1 percent of the respondents strongly agreed. But, 46.7% percent of the respondents agreed, and 20.11 percent of the respondents were undecided.

Regarding the lack of a common data analysis system in higher education institutions, the majority of the respondents (50.5%) agreed, and 3.02% disagreed. However 18.8% of respondents were undecided with the mean value 2.0 and SD 0.811, which indicates that a lack of a common data analysis system is a major challenge for implementing digital technologies in the education sector.

Table 4.11 challenges of open data utilization

No	Variables	SA	A	U	D	SD	Mean	Std. dev
1	lack of data literacy	22.95%	53.55%	53.55%	3.43%	2.11%	2.05	.78
2	lack of awareness	22.28%	51.90%	20.65%	3.53%	1.63%	2.1	.84
3	lack of availability of information about openly available	23.10%	51.36%	19.57%	5.71%	0.27%	2	.82
4	Limitation in data collection/recording of open data.	26.09%	57.61%	12.23%	3.80%	0.27%	1.9	.74
5	ICT-related issues	19.84	67.12 %	10.33%	2.17%	0.54%	1.96	.66
6	lack of a data management system	23.10%	46.74%	20.11%	8.42%	1.63%	2.18	.93
7	Lack of technical support to use open data.	26.36%	52.72%	13.04%	7.61%	0.27%	2.02	.85
8	Lack of an open data implementation strategy or policy	26.36%	52.17%	14.67%	6.25%	0.54%	2.02	.84
9	Lack of leadership or organizational support to use open data	31.25%	48.10%	17.93%	2.17%	0.54%	1.9	.78
10	lack of a common data analysis system	26.90%	50.54%	18.48%	3.53%	0.54%	2.0	.80
11	Open data can be biased or incomplete.	27.17%	46.47%	19.57%	6.25%	0.54%	2.21	.84

#### 4.1.5.1 Internet Connectivity in the Universities

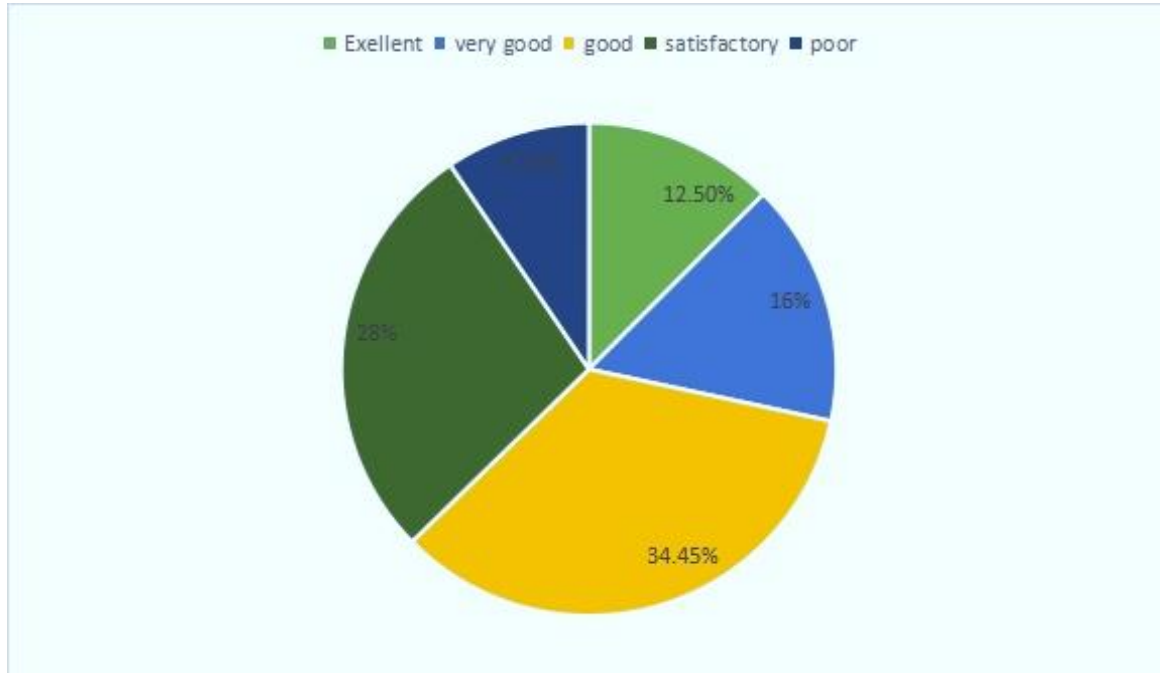


Figure 4.3 Level of Internet connectivity at universities

As the pie chart above shows, 34.45% of the respondents answered the level of Internet connectivity is good. 28% of them indicated that it is satisfactory, 16% indicated that the level of Internet connectivity is very good, 12.50% of respondents said that the Internet connectivity of their university is excellent and 9.05% of them indicated that it is poor. This shows the current status of internet connectivity in the university is okay to utilize open data for the users because the majority responded with good and very good.

Table 4.12 Analysis of the Students' Response Regarding the Challenges of Open Data on Educational Quality

No	Variables	SA	A	U	D	SD	Mea n	Std. dev
1	I lack of knowledge and skills needed to use open-data	25.15%	49.70%	25.1%	-	-	2	.71
2	Limitation in data collection of open data in my university.	34.91%	39.35%	25.74%	-	-	1.9	.77
3	ICT-related issues or restricted access to data.	23.37%	60.64%	7.99%	8.87 %	-	1.84	.53
4	Lack of technical support to use open data.	55.74%	30.5%	15.88%	-	-	2.4	.88
5	There is a lack of awareness	23.29%	58.65%	11.6%	7.1%	-	1.76	.43

The findings of Table 4.12 on the respondents' use of open data in their teaching activities reveal that 49.7% of the respondents found it challenging to incorporate these technologies into predetermined teaching activities or lack of knowledge and skills. However, 21.5% of the respondents were undecided. With a mean of 2 and a standard deviation of 0.71, the data show that student found it challenging to incorporate digital technologies into their learning. Lack of ICT-related issues or restricted like (hardware, software, and digital information) was cited by 39.35% with a mean value of 1.84 and Std. dev 0.53. for more respondents as a major obstacle to implementing open data in their organizations, according to the survey results on Lack of technical support (192) 55.74% of the respondents strongly agreed and 15.88% said neutral. The standard deviation of this response is 0.88 and its mean value is 2.4. Regarding the lack of awareness to integrate open data into their teaching practices, 23.29 percent of the respondents strongly agreed. 58.65% of the respondents agreed but, 11.6 % of the respondents were undecided.

## 4.1.6 Analysis by using Inferential Statistics

### 4.1.6.1 Correlation Analysis

Table 4.13 Correlation analysis for the effect of Data-driven decision-making

Correlations					
		Learning Outcomes	Engaging Learning process	Learning experience	Learning interest
learning outcomes	Pearson Correlation	1	.254**	.474**	.432**
	Sig. (1-tailed)		<.001	<.001	<.001
	N	336	336	336	336
Engaging learning process	Pearson Correlation	.254**	1	.430**	.447**
	Sig. (1-tailed)	<.001		<.001	<.001
	N	336	336	336	336
Learning experience	Pearson Correlation	.474**	.430**	1	.439**
	Sig. (1-tailed)	<.001	<.001		<.001
	N	336	348	350	336
Learning interest	Pearson Correlation	.432**	.447**	.499**	1
	Sig. (1-tailed)	.001	.001	.001	
	N	336	336	336	336

As you can see from the output, the relationship between learning process and learning outcomes is both a positive and statistically significant. As a person reports higher levels of learning process, they are more likely to report higher levels of learning outcomes. The reverse is true of the relationship between learning experience and learning outcomes, with these showing a significant positive relationship. The greater levels of learning experience, the more likely the person is to have lower levels of learning outcomes. All relationships are significant (see p values) and are high in strength.

Table 4.14 Linear regression summary model for the effect of quality of education

<b>Model Summary's</b>				
Model	R	R <sup>2</sup>	Adjusted R <sup>2</sup>	Std. Error of the Estimate
1	.602 <sup>a</sup>	.685	.627	.61

- a. Predictors: (Constant), Open data helps me make more informed decisions about education, Open data utilization makes teaching more interesting., learning process more engaging.
- b. Dependent Variable: quality of education.

#### **4.1.6.2 Result of Regression Analysis**

The results in Table 4.14 show that variables, where R (coefficient of correlation) has a positive correlation of 0.60, indicate that open data variables are related to the quality of education. The R square in the table shows 0.685, meaning that the identified dependent variables (student learning outcomes, student engagement and motivation, and experience) explain sixty-eight percent (68%) of the variation in the independent variable.

#### **4.1.6.3 Analysis of Variance**

The study used ANOVA to establish whether the overall regression model is significant or not

Table 4.15 Summary of One-way ANOVA

ANOVA <sup>a</sup>						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	211.7	3	48.9	76.3	<.001 <sup>b</sup>
	Residual	123.6	332	.337		
	Total	335.4	335			

- a. Dependent Variable: Quality of education
- b. Predictors: (Constant), learning experience, learning, engagement

According to Table 4.15 above, an analysis of variance (ANOVA) showed a significant association existed between the variables included in the study, with  $F = 76.3$  and  $p = 0.01$ . This is shown by the high F-values (76.3) and low p-values (0.01) F value, p-value which fall below the 5% level of significance. This shows that the regression model's ability to forecast how DDDM will affect the quality of education in HEI teaching and learning methods is statistically significant. Because the dependent variable is substantially determined by the independent variables, an analysis with a confidence level based at 95% suggests a high reliability of the results. This suggests that a unit increase in the variable acquired in the regression model results in a comparable increase in performance when all other parameters are held constant. However, his value of F is above the 5% level of significance, which means that the null hypothesis is rejected. This indicates that there is a significant difference between both variables.

Table 4.16 Co-efficient of determination

Model		Coefficients			T	Sig.
		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta		
1	(Constant)	.55	.12		4.46	<.001
	Engaging learning process	.1	.04	.15	3.27	.08
	Learning motivation	.38	.059	.35	6.52	.001
	Learn experience	.26	.05	.26	5.22	.056

a. Dependent Variable: quality of education

The model coefficients in Table 4.16 show a moderately positive link between DDDM and the effectiveness of HEIs' teaching and learning methods. As shown in the table above, when the variables were combined, improving efficiency and productivity had the highest regression coefficient, with a beta value of  $\beta$  (0.38) and a p-value of 0.01. This was followed by learning experience, with a beta value of  $\beta$  (0.26) and a p-value of 0.56, and Engaging learning process, with a beta value of 0.1 and a p-value of 0.08. The table of the regression analysis demonstrates that every regression had a favorable effect on the quality of schooling, and every independent variable was significant.

#### 4.2 Qualitative Data Analysis

Respondents were selected from ICT directors, library directors, and professionals, and the researcher conducted interviews with respondents from the four institutions. Interview findings indicate that academic staff are trying to achieve teaching and learning methods, quality of

education, and competitive goals. Higher education institutions are implementing advanced methods in their teaching and learning systems. Utilizing open data and DDDM is essential for improving the academic standards of higher education institutions. Qualitative data analysis was carried out through interviews with respondents attending the selected universities.

#### **4.2.1 Current Usage Status of Open Data**

To determine the current usage status of open data on the selected universities some questions were prepared. The questions were: “What is the current usage status of open data for quality education in your university? What open data platforms are commonly used in your educational institution? can these open data resources contribute to education quality?” based on the question the respondents gave some suggestions. In general, the use of open data is not so well known and widely used in these selected universities, but if its use is increased beyond the existing one, it will help to improve the quality of education and also increase students' outcomes. Regarding what open data platforms are commonly used in the institution, more of the respondents said that they use institutional repositories extensively.

Working with different types of data allowed students to build and improve data and digital skills, e.g., computer skills, visualization skills, data-handling skills, etc. However, students also encountered issues when working with open data, such as the data concept being too abstract, and they required additional assistance to understand how data is used to understand a problem. Furthermore, students also lose interest due to some out-of-date data sets. In some cases, teachers suggested that it is important for students to collect and interpret data themselves. This will help in understanding the concept of data and how to solve problems using data.

#### **4.2.2 Effect of Data-Driven Decision-Making**

To assess the effect of data-driven decision-making on education quality some qualitative data have been collected. The respondents were asked a questions: in your organization, what are the major benefits of open data usage? In your opinion, has open data utilization led to better learning

outcomes for students? If so how? If not why not? They claimed that "one reason for using open data in an institution is to improve the quality of education, increase productivity, and be more effective and efficient by guiding and empowering students." How do you say DDDM can be further used to improve the quality of education? It make system of collecting and analyzing various types of data, including input, process, outcome and satisfaction data, to guide a range of decisions to help improve the success of students and institution. If we use DDDM in our institution properly or fully it can further improve the quality of education." It will change the institution and its decision-making process.

Overall the response from the respondents was the importance of DDDM as a tool to enable support for access to good education and quality learning, Access to more information and data based decision helps to access a wide range of information that can be used to enhance teaching and learning. Increased engagement: Digital tools can be used to create interactive and engaging learning experiences that can help students stay focused and motivated. Flexibility and convenience: digital learning materials can be accessed anytime and from anywhere, allowing students to learn on their own. Because the quality of education is very important. The level of DDDM of all four selected universities is not enough. Ho wever, their usage differs from each other, depending on experience and access to digital resources. It is useful for Jimma, Mizan, Bonga, and MeU universities to focus on adopting data-driven decision-making practice.

#### **4.2.3 Challenge of Open Data Utilization**

Open data will have a positive impact on students to improve their potential for efficiency and productivity. "Regarding to challenges of implementing open data in Ethiopian HEIs, in selected area there is similar challenges. According to the persons interviewed, lack of data literacy and awareness, lack of skilled manpower, lack of training, lack of common data analysis system, availability of information, and inadequate attention are the main challenges mentioned for utilizing open data in teaching and learning method HEIs.

Overall the response from the respondents was the importance of open data utilization as a tool to enable support for access to good education and quality learning. Open data has a huge potential for use in learning activities, Increased range and reduced cost of resources, and Support for adaptation of materials, which allows educators and students to be active participants who learn by doing and creating, building capacity by providing educators access to the means of production of the resources. Open data offers the potential for personalized learning, for example by supporting a student to learn with data on topics of interest to them. But they also mentioned didactic challenges and the following technical challenges.

One of the most significant issues is the lack of familiarity with open data as an educational resource. Teachers are unaware of the concept of open data and how to incorporate it into their teaching, but this lack of understanding can be remedied through workshops, training, and seminars. Teachers are ignorant of open data portals and instead rely on national statistical websites, for which they must obtain authorization in some situations and also sanitize the data. Organizing workshops and seminars with success stories in which teachers discuss their own experiences accessing appropriate data sets as part of their instruction could help to tackle this challenge.

Another problem that teachers mentioned in integrating open data into education is a lack of university resources, such as computer laboratories that are not always available or students who do not have computers. Furthermore, teachers and students must have data abilities in order to extract smaller data sets from larger ones. They may also require computer abilities in order to exhibit or explain various graphs to students. Training and short courses can help teachers and students expand their knowledge about open data.

#### **4.2.4 Thematic Analysis**

Initial codes were generated by the researcher in the initial stage of thematic analysis to describe concepts in the interview transcripts. These were refined and sorted into broader themes. Further stages of analysis explored the relationships between these themes. The final stage then focused

on how these themes could be refined to support answering the research questions by splitting or combining themes that contained multiple concepts within them.

Table 4.17 Themes identified within the ‘teaching approach’ category

Theme	Count of interviews where the theme was identified	Definition
Simplification	5	Limitations of time or skills require that the data sources and activities are simplified or structured, so learners not to be overwhelmed
Harnessing learner motivations	6	Open data-based activities can be linked with learner motivations
Choices for personalization	4	Giving learners the capacity to choose different foci within the data sets and pursue their interests
Process-based assessments	3	Assessments tended to consider whether students used a suitable process and sources

Table 4.18 Themes identified within the ‘skills and knowledge’ category

Themes	Count of interviews where the theme was identified	Definition
Developing educator data literacies	7	Skills to teach with open data were needed and could be a barrier
Managing data literacy requirements	9	Technical and conceptual skills are required to understand data and use it effectively
Developing student digital literacies	5	Open data-based activities require the development of more general digital skills

Table 4.19 Themes identified within the ‘characteristics for learning’ category

Theme	Count of interviews where the theme was identified	Definition
Basis for learning data literacy	5	Open data has value as a basis for developing data literacy which is essential in the modern world
Advanced possibilities for activities	4	Open data allows learning activities to reach advanced levels of complexity, such as engaging students with activities normally undertaken by professionals
Authentic experiences	6	creates learning experiences that reflect the complexity of real-world problems

### 4.3 Discussion

The study suggests the use of open data in learning is low in the institutions considered for this study. Respondents to a survey on open data use in education were not making use of open data as expected. It can be said that there is a lack of awareness of open data among educators and a challenge to clarify its distinct value. Most (53.51%) of respondents do not agree with accessing or using open data portals. according to this study, this is due to a lack of sufficient understanding and experience. it is also related to challenges/problems to utilize.

The previous study supported this finding because it was reported that open data and DDDM has impact on quality of education in higher education ((Zaborova, 2021)). The inferential statistics showed that open data has effective (average of 51.1%) on quality of education of HEIs. The survey showed that most of the students agreed that open data provides them access to unlimited

sources of information, reveals connections between topics, and encourages the way students learn. The survey further showed that the majority of teachers (55% 186) agreed that open data is easier and more effective, helps further develop teacher's computer skills, and brings out the best in students. Interestingly, both parties agreed that open data would help teachers and students share responsibility for learning and achievement.

Qualitative analysis shows that open data has helped to improve the quality of education, by stimulating student interest, enhancing personalized learning, increasing satisfaction, saving costs, increasing efficiency, and improving productivity and learning outcomes of students. Also, the adoption of open data has enabled them to relax from tedious to easy and enjoyable, making information easier for users, as well as increasing knowledge enhancement of their knowledge. Open data provides new and improved services that are easier to use, more efficient, and more reliable.

This finding is consistent with Corrales-Garay et al., (2019) who investigated whether the use of open data as a learning resource is enhancing the quality of narratives, implying that the rapid change in open data is improving the quality of education.

Open data also presented advanced possibilities for activities that reflected higher-level professional or academic practices, and the potential for authentic learning experiences drawing on real-world data and processes. A final characteristic is that open data provides a basis for teaching data literacy. This was a motivation for educators engaged with data literacy to develop awareness and public participation with open data.

The descriptive analysis revealed that open data has a positive effect on educational quality in terms of student learning outcomes, student engagement and motivation, learning effectiveness, and learning experience HEI. This finding is consistent with (Ahmed, 2018) who examined data-based decision-making in primary schools in Ethiopia, suggesting that the rapid change in data-driven decision-making is improving the quality of narratives. Most (53.5%) of respondents agreed

on the effect of DDDM on improving the quality of education by leading to better learning outcomes. Also, 59.86 % of respondents agreed that DDDM has helped in reducing the achievement gap between students from different socioeconomic backgrounds. Regarding DDDM, it has influenced the development of their critical thinking and problem-solving skills, 58.1 % of respondents agreed. The study showed that 59.1 % of respondents agreed, using DDDM was very effective in increasing their engagement and motivation in the classroom. The previous study supported this finding because it was reported that DDDM has an impact on the quality of education in higher education (Ahmed, 2018).

Data-driven decision-making can offer many benefits for education, such as enhancing student learning and achievement, improving teaching and curriculum, increasing accountability and transparency, and fostering collaboration and innovation, assessing students' needs, strengths, and preferences, as well as reflect on their practices and effectiveness. It can also assist in aligning curriculum with the standards and interests of students, demonstrating the impact and value of their work, responding to feedback, and sharing data. Additionally, DDDM can help educators to set goals for students, provide personalized instruction and feedback, identify areas for improvement and professional development, communicate results and achievements to audiences, explore new possibilities and opportunities, and experiment with new approaches and strategies.

Teachers also pointed out challenges and also suggestions for using open data. This finding is consistent with (Corrales-Garay et al., 2019), who investigated the open data interface ( ODI ) framework for public utilization of big data. Overall, the teachers were satisfied with the open data utilization, but they also mentioned didactic challenges and the following technical challenges:

Unfamiliarity with using real data sets: One of the main challenges is unfamiliarity with open data as an educational resource. Teachers are not aware of the concept of open data and how they could integrate it into their teaching, but this lack of awareness could be alleviated through workshops, training, and seminars.

Relevant educational data sets: Teachers are unaware of open data portals, and they mostly use national statistical websites, in which they need permission in some cases, and also need to clean the data. Arranging workshops and seminars with success stories in which teachers share their own experiences accessing relevant data sets as part of their teaching could solve this problem.

Lack of data skills: Teachers and students need data skills to extract smaller data sets from bigger ones. They also might need computer skills to present or explain different graphs to students. Training and short courses can extend teachers' and students' existing skills to work with open data.

Lack of resources: One of the challenges that teachers discussed in integrating open data into education is limited resources in university, such as computer labs not always being available, or students not having their computers.

#### **4.4 A Framework to Support the Use of Open Data in Education**

A conceptual framework using this analysis is presented in Fig 2.1 This is grounded in the questionnaire analysis and themes raised in the interview analysis but elaborates on the relationships between the categories which suggests how further practice research, and development could support open data to become a mainstream part of learning activities. This framework can guide thinking around the construction of learning activities using open data or could inform wider initiatives to engage educators with open data.

The framework highlights the interconnected nature of each category. Here we highlight some of the interconnected relationships across these that should be a focus for further research and development.

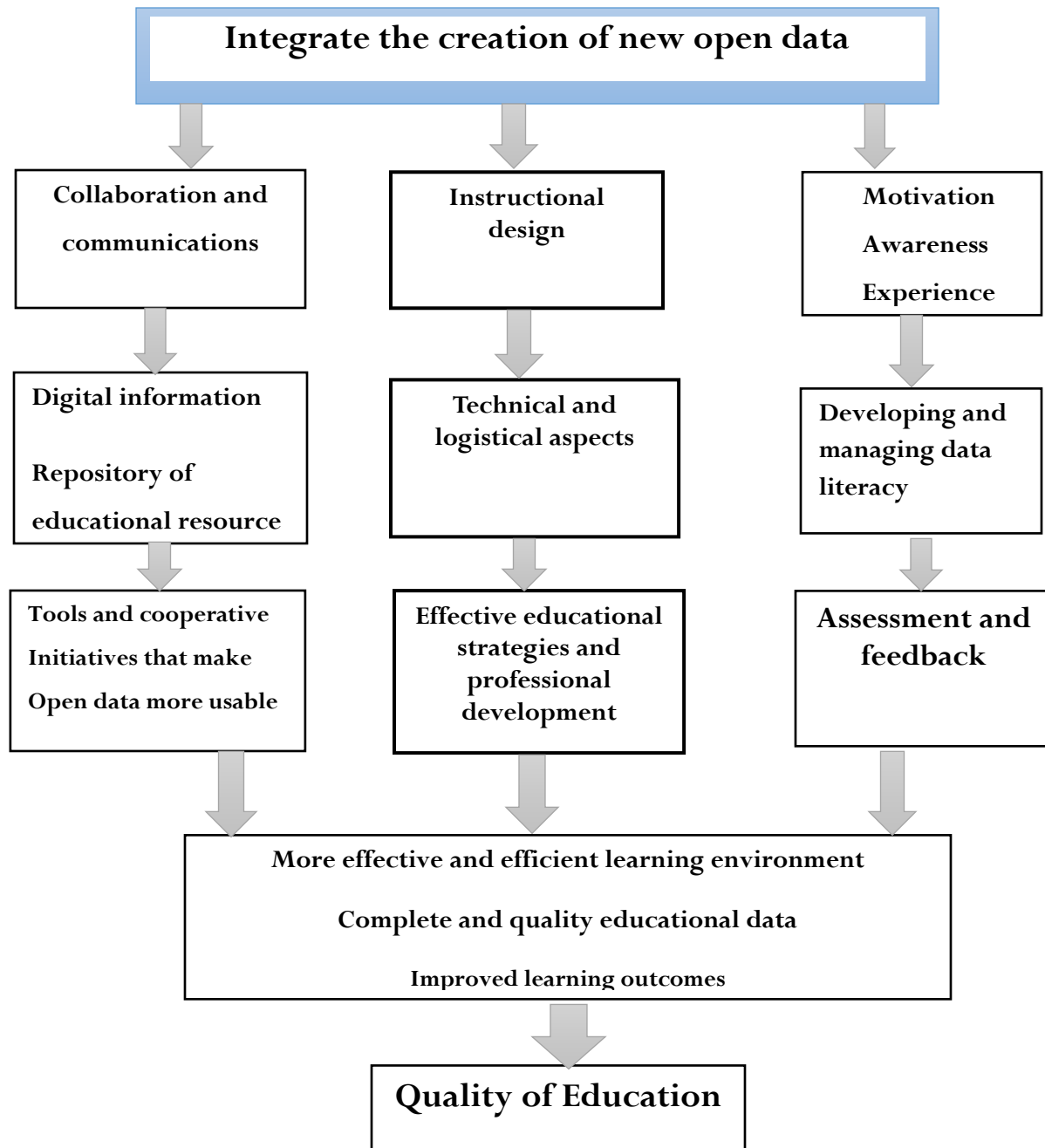


Figure 4.4 The proposed framework for integrating quality education through open data

**Tools and cooperation:** Can help to assessing the needs, strengths, progress, and performance of the HEIs and students developing and revising organization plans, targets, and goals monitoring the implementation of organization practices, programs, and policies.

**Digital Infrastructure Resources;** Make it easier for students to access educational resources from anywhere and at any time. This is particularly beneficial for students who may not have access to traditional classroom settings. Digital infrastructure resources can be used to create interactive and engaging learning experiences that help students to stay focused and motivated and also enhanced collaboration.

**Instructional Design:** Instructional design can help in creating interactive and engaging digital learning materials that enhance the learning experience of students. It can also help in creating personalized learning experiences that cater to the individual needs and preferences of students.

**Infrastructure and Access;** Can provide access to a wealth of educational materials and resources, including e-books, online libraries, and interactive learning tools. This makes it easier for students to access and learn from a variety of sources. Infrastructure resources can facilitate communication and collaboration between students and teachers, as well as facilitate communication and collaboration between students and teachers.

**Repository of educational resources:** can provide to house, and make searchable, textbooks, courseware, and individual learning objects.

**Assessment and collaboration:** Digital assessment tools can provide more accurate and efficient assessments of student learning outcomes and immediate feedback: Digital assessments can provide immediate feedback to students, enabling them to identify areas where they need to improve and take corrective measures. Personalized learning: Digital assessments can be customized to meet the individual needs of students, providing them with a personalized.

**Data Literacy:** For educators and learners, data literacy is both a requirement and a potential learning outcome. At the same time, pedagogical expertise from the education sector would be beneficial in reducing barriers to public engagement with open data, which is a goal of many open data initiatives.

**Public engagement:** it improves communication skills and enhances learning. It also equips students with transferable skills, improves their employability, and engages with methods such as application and evaluation of knowledge that lead to deeper and more associative processing of material.

**Effective educational strategies and professional development;** with open data to improve the accessibility of education, education can be accessed from anywhere, anytime and by anyone. This means that students who may not have had access to quality education before can now benefit from it. Also, open data allows for personalized learning experiences, where students can learn at their own place and according to their own style of learning.

**Quality of Education:** A multidimensional concept that signifies the degree of excellence in the educational process. It encompasses both the quality of the result of the educational process and the characteristics of the quality assurance system. The quality of the result reflects the level of training of graduates and their compliance with standards. The quality assurance system includes various factors such as the content of education, the level of training of students, teaching staff, educational resources, and the use of educational technologies.

## **SECTION FIVE**

### **5. Conclusion and Recommendations**

#### **5.1 Conclusion**

Higher education institutions open data usage and data-driven decision-making practices in teaching and learning are at an infant stage. Because several critical activities are not widely practiced in HEIs and may jeopardize educational achievement or quality such as collection of data through metrics and specific key performance indicators, identifying and analyzing the patterns and insights within that data. These include a lack of digital resources, finances, training, awareness, guidelines, internet connection, and motivation. The usefulness of open data in boosting educational quality has shown a strong positive effect at the university level. The integration of technology in teaching and learning has enhanced access to information, improved student engagement and participation, and facilitated effective communication between open data and instructors.

This study revealed the existence of a beneficial relationship between open data and teaching and learning approaches. This was evident from the variables examined in the use of open data and teaching and learning activities in HEIs: student engagement and motivation, individual learning effectiveness, enhancing the learning experience, developing teaching methods and learning, and being more engaged and interactive.

#### **5.2 Recommendations**

The researcher recommended that Ethiopian higher education institutions place a heavy emphasis on open data usage to be effective and to enhance educational quality in light of the aforementioned findings.

The open data usage of HEI affects the teaching and learning processes in all higher education institutions. Therefore, they should incorporate student motivation and engagement, individual

learning effectiveness, improving the learning experience, instructional strategies, and more interactive and engaging digital technology to provide quality education. This is because incorporating digital technology into teaching and learning strategies has a significant impact on enhancing the quality of instruction in higher education institutions.

Moreover, it is recommended that universities should develop standard digital content that is accessible to students and faculty members, including online textbooks and tutorials. a variety of tools and technology made available by open data can help students their skills and academic performance.

### **Limitations and Future Work**

In line with many qualitative and quantitative studies, this research has focused on in-depth analysis of rich data from a small sample. The limited mainstream use of open data in education to date constrained the sample of interviewees and questionnaires. This research has identified a set of reasons and approaches to using open data in teaching. It did not seek to measure the effectiveness of open data in a specific pedagogical approach. Future work should seek to measure.

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## APPENDIX

### Appendix 1

#### Dear respondents:

Dear respondent

This questionnaire is designed for research entitled “Investigating the Status of Open Data Utilization and the Effect of Data-Driven Decision-making Approach on Improving Higher Education Quality in Ethiopia”. To achieve the intended objective of this study, your careful and honest responses are quite crucial. Thus, you are kindly requested to complete the questionnaire carefully and honestly. Your responses will be kept confidential. Please read the instructions and give your response suitably. If you want to change any of your responses, make sure that you cancel the unwanted ones.

**Note:-** No need to write the name

#### Questionnaire for Instructors

##### Section 1: Demographic questions

1	Which university you are from? Jimma <input type="checkbox"/> Mizan-Tepi <input type="checkbox"/> Bonga <input type="checkbox"/> Mettu <input type="checkbox"/>
2	Your gender:      Male <input type="checkbox"/> Female <input type="checkbox"/>

3	<p>What is your highest academic qualification?</p> <p>Bachelor's degree <input type="checkbox"/> Master's degree <input type="checkbox"/> PhD. <input type="checkbox"/></p> <p>Other (Specify) _____</p>
4	<p>What is your academic rank at your university?</p> <p>Assistant lecturer <input type="checkbox"/> Lecturer <input type="checkbox"/> Assistant Professor <input type="checkbox"/></p> <p>Associate professor <input type="checkbox"/> Professor <input type="checkbox"/></p>
5	<p>Under which category your age falls?</p> <p>25-30 <input type="checkbox"/> 43-48 <input type="checkbox"/> 31-36 <input type="checkbox"/> 37-42 <input type="checkbox"/> 49 and above <input type="checkbox"/></p>
6	<p>Your department _____</p>

**Section 2: Closed-ended questions on open data for quality of education**

Please check (✓ or X) against each of the statements listed below that you think are used at your University.

<b>The current usage status of open data in education</b>	
1	<p>Have you accessed or used national open data portals for the teaching and learning activities at your university? Yes <input type="checkbox"/> No <input type="checkbox"/></p>
2	<p>If your answer is “yes” for Q#1, please list them.</p> <p>_____</p> <p>_____</p> <p>If your answer is “no” for Q #1, why</p> <p>_____</p>

3	<p>How many months or years of experience do you have in using open data for teaching and learning activities at your university?</p> <p>Less than one year <input type="checkbox"/>      1-3 yrs.' <input type="checkbox"/>      3-5 yrs.' <input type="checkbox"/>      Above 5 yrs.' <input type="checkbox"/></p>
4	<p>Have you ever contributed your data for public access on your university's open data portal?</p> <p>Yes <input type="checkbox"/>      No <input type="checkbox"/></p>
5	<p>For which purpose(s) do you use open data at your university? Please select all that apply to you.</p> <p>For planning <input type="checkbox"/>                      For teaching-learning <input type="checkbox"/>                      For demonstration <input type="checkbox"/></p> <p>For assessment <input type="checkbox"/>                      For institutional discussion <input type="checkbox"/></p> <p>Other (specify) _____</p>
6	<p>Which type of open educational resources do you use for teaching learning activities at your university?</p> <p>Text books <input type="checkbox"/>                      Journal articles <input type="checkbox"/>                      Datasets <input type="checkbox"/>                      Visualizations (graphs, figures...) <input type="checkbox"/></p> <p>Scientific formulas <input type="checkbox"/>                      Software <input type="checkbox"/></p> <p>Lecture notes, handouts, and assignments <input type="checkbox"/></p> <p>Other (please specify)_____</p>

Intensity of use						
		N	R	S	O	V
		e	a	o	f	e
		v	r	m	t	r
		e	e	e	e	y
		r	l	t	n	o
			y	i		f
				m		t
				e		e
				s		n
	How often do you use open data for the following educational tasks?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	For planning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	For teaching-learning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	For demonstration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	For assessment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	For institutional discussion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Effect of data-driven decision-making</b>						
No	Parameters	SA	A	U	D	SD
						Mean
						SD

1	There is a culture of promoting data usage for decision-making in your university.							
2	DDDM brings improvements in the completeness and quality of educational data							
3	DDDM helps to identify academic bottlenecks to required courses with low pass rates							
4	DM allows for responsive course material improvements							
5	DDDM directs instructional practices in the classroom; instructional interventions improve student outcomes.							
6	DDDM can increase a positive attitude toward data usage.							
7	DDDM can increase the ability to transform classrooms and lead to dramatic improvements in							

	an educator's responsiveness to students							
<b>The challenge of open data Utilization</b>								
	<i>Statements</i>	<b>SA</b>	<b>A</b>	<b>U</b>	<b>D</b>	<b>SD</b>		
1	There is a lack of data literacy (e.g., the knowledge and skills needed to analyze and work with open data)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
2	There is a lack of awareness about the use of open data in education	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
3	There is a lack of availability of information about openly available data usage.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
4	There is a limitation in data collection/recording of open data.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
5	There are ICT-related issues like insufficient resources (hardware, software, internet connection) or restricted access to data.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
6	There is a lack of data management systems at my university.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
7	Lack of technical support to use open data.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
8	Lack of an open data implementation strategy or policy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		

9	Lack of leadership or organizational support to use open data	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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### Questionnaire for Instructors

#### Section 1: Demographic questions

1	Which university you are from? Jimma <input type="checkbox"/> Mizan-Tepi <input type="checkbox"/> Bonga <input type="checkbox"/> Mettu <input type="checkbox"/>
2	Your gender:      Male <input type="checkbox"/> Female <input type="checkbox"/>
3	What is your department: _____
4	Which year student are you? Second year <input type="checkbox"/> Third year <input type="checkbox"/> Fourth year <input type="checkbox"/> Fiveth year <input type="checkbox"/> Sixth year <input type="checkbox"/>
5	Under which category your age falls? 18-20 <input type="checkbox"/> 21-24 <input type="checkbox"/> 25- 28 <input type="checkbox"/> 29 and above <input type="checkbox"/>

#### Section 2: Closed-ended questions on open data for quality of education

Please check (✓ or X) against each of the statements listed below that you think are used at your University.

The current usage status of open data in education	
1	Does your university have open educational resources for public access?      Yes <input type="checkbox"/> No <input type="checkbox"/>

2	Have you accessed or used national open data portals for the teaching and learning activities at your university?	Yes <input type="checkbox"/> No <input type="checkbox"/>
3	<p>For which purpose(s) do you use open data at your university? Please select all that apply to you.</p> <p>For software development <input type="checkbox"/> For reading <input type="checkbox"/> For assignment work <input type="checkbox"/> For laboratory work <input type="checkbox"/></p> <p>For presentation <input type="checkbox"/> For research <input type="checkbox"/> For community service <input type="checkbox"/></p> <p>Other (specify) _____</p>	
4	<p>Which type of open educational resources do you use for educational activities at your university?</p> <p>Text books <input type="checkbox"/> Journal articles <input type="checkbox"/> Datasets <input type="checkbox"/></p> <p>Visualizations (graphs, figures...) <input type="checkbox"/> Scientific formulas <input type="checkbox"/></p> <p>Software <input type="checkbox"/> Lecture notes, handouts, and assignments <input type="checkbox"/></p> <p>Other (please specify) _____</p>	

No	variables	SA	A	U	D	SD
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1	I lack of knowledge and skills needed to use open-data					
2	There is a limitation in data collection/recording of open data in my university.					
3	There are ICT-related issues like insufficient resources (hardware, software, internet connection) or restricted access to data.					
4	Lack of technical support to use open data.					
5	There is a lack of awareness about the use of open data in education					

## Appendix 2

### Interview guide questions for open data utilization

#### Background information

A. Name of university: \_\_\_\_\_

B. Respondent position: \_\_\_\_\_

C. Respondent gender: \_\_\_\_\_

#### For University

1. What is the current usage status of open data for quality education in your university?

2. What open data platforms are commonly used in your educational institution? (e.g., institutional repository, reports ...), can these open data resources contribute to education quality?
3. What are the major benefits of open data usage in institutions?
4. In your opinion, has open data utilization led to better learning outcomes for students? If so how? If not why not?
5. What are the major challenges and the extent of influence of open data usage in your institution?
6. What are the practices of using data-driven decision-making for quality of education in university?
7. Do you think that open data contributes to decision-making to improve education quality?

