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Development and Validation of a Webquest on Conic Section

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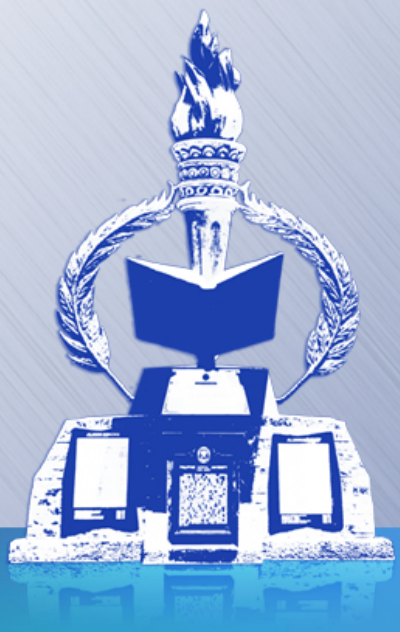

DEVELOPMENT AND VALIDATION OF A WEBQUEST ON CONIC SECTIONS

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Master of Arts in Teaching Mathematics

By
Roy Carlo L. Advincula
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Dedication

To my beloved family,

true friends,

dear students,

and to all those who never stopped

believing in me.

ABSTRACT

Name: Roy Carlo L. Advincula

Title: Development and Validation of a WebQuest on Conic Sections

Key Concepts: WebQuest development, conic sections, student perception

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The main purpose of this study is to develop and validate a WebQuest on conic sections. Specifically, it sought to develop and validate a WebQuest on conic sections. Specifically, to: (1) develop a WebQuest on conic sections; (2) validate the WebQuest with the help of experts in mathematics and educational technology; and (3) evaluate the effectiveness of the WebQuest as perceived by students after using the WebQuest. Four phases were undertaken in this study, namely: preparation stage; development stage; validation stage; and try-out stage. The development of the WebQuest followed the steps prescribed by the San Diego State University webpage were WebQuests originated. The key elements of a WebQuests were all included in the developed material. The difficulties encountered by students in studying conic sections were considered in the development stage of the WebQuest. The respondents of the study were 3 experts, and 92 students of San Beda College Alabang. The WebQuest was validated by the three experts using the evaluation tool adapted from Zunal.com. The perceptions of the student respondents were obtained using a survey questionnaire. The data obtained were analyzed by using descriptive data analysis procedure. Findings revealed that the WebQuest is appropriate

for classroom instruction. The WebQuest has been deemed effective in guiding students and in engaging students in learning mathematics. It fosters constructivism in learning through an interactive learning environment where the students get to build knowledge through their experience.

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The Problem and its Background

Introduction

"Harness the power of the Internet. Integrate. Use computers in the classroom. Integrate. Retrieve your students' attention. Use your students' natural enthusiasm for the Internet to further learning. Breathe new life into research projects. Integrate. Integrate. Integrate."

- Ruth Kohut

Since the introduction of the use of technology in the educational setting, educators always yearn to find more ways to integrate it in their classroom. Technology is not only used to improve the presentation of lessons in the aesthetic level, but more importantly, it is incorporated in actual teaching strategies that will facilitate the learning of students and in the curriculum itself. Educators have been inundated with current innovations aimed at integrating technology into classroom instruction (Watson, 1999). In the Philippines, computerization program in schools has been carried out and articulated since the Aquino administration (Callueng, 2001).

Efforts to integrate the Internet in the Philippine classrooms have been very evident for the past ten years. To enhance the government computerization program in public high school, the Department of Education has directed all public high schools to avail of an internet subscription through the Gearing-Up Internet Literacy and Access for Student [GILAS] project and the DepEd Internet Connectivity Project [DICP] (Lapus, 2009). GILAS was a project by various sectors that aimed to give Internet access to students and basic Internet literacy programs

in all the 5,443 public secondary schools in the country. The program was led by a group of private corporations and civic organizations, in coordination with the Department of Education. The use of Information and Communications Technology [ICT] as an integral part of the curriculum will continue to be sought after in schools where such technologies may already be existing. The utilization of different instructional media is recommended. Similarly, learning shall be reached as far as practicable to the community as the school's laboratory for authentic learning (Abad, 2005).

However, whether technology or more specifically the Internet is utilized in the classroom or not is not the only question an educator should ponder upon; it is on how technology is used that should be considered more by teachers. It is rather rare that technology is utilized in the classroom to engage the learners in powerful and significant learning. According to VanFossen (2004), a probable explanation for the shortage of the use of technology in class is that the procedure of discovering valuable information from among the huge number of websites accessible on numerous subject matters has been compared to attempting to drink from a water hose. This dilemma, thus, makes the development of curriculum troublesome for practitioners already strapped for time. Teachers usually do not have the time to incorporate technology effectively, yet, utilizing technology to promote innovative teaching and learning is a must for all educators (Strickland & Nazzal, 2005).

WebQuest, an inquiry-oriented activity, might be one answer in suitably incorporating technology in the classroom. It strengthens the education research connections to critical thinking, analysis, multiple intelligence, and constructivism (Kohut, 2002).

In the light of the importance and benefits of designing web-based activities for the students, the researcher embarked on a study to develop and validate a WebQuest on conic sections for the students to consider the Internet as a valuable and practical source to study mathematics. The Internet already has the vast resources in learning mathematics, and students need to be guided to utilize these resources. The need to develop a WebQuest on conic sections was inspired by the fact that WebQuest is rarely used in the local classrooms which is evident in the limited number of studies related to WebQuests in the country. This study hopes to guide teachers in creating and using WebQuests that may aid them in facilitating the learning of their students.

Conceptual Framework

Constructivism stands firm that individuals construct knowledge through their own experiences and that one's progress is first and foremost qualitative (Savery & Duffy, 1995). The utilization of tools, the connections between past experiences, and the continuous practices of instruction are essential for constructive learning (Savery & Duffy, 1995).

At the heart of constructivism is the stand that an individual plays a dynamic role in the learning process, and does not just receive facts passively. For that reason, teachers must prepare environments for learning that develop the curiosity, motivation, and the desire of the learners to search for answers and solutions. Through the learners' active participation, the objective of instruction is for them to think critically, ponder upon, and create important organizational structures of the acquired knowledge (Tobias & Duffy, 2009).

Traditional teaching in mathematics is being replaced by inquiry-based teaching, supporting a constructivist learning structure. Supporters of the constructivist-teaching model propose a more student-centered math classroom that takes away the focus from rote memorization of skills and facts but rather concentrate on problem solving (Draper, 2002).

Constructivism is the primary theory supporting the WebQuest model; it promotes Inquiry-Based Learning. Constructive environments of learning are interactive and as a result, ease the formation of knowledge through the utilization of tools, and place the learner at the center of the teaching process (Shuell, 1990). WebQuests help the understanding and creation of relations between the aspects of learning and also present opportunities to reflect upon and associate learning ideas with the real world (March, 2003). The very nature of WebQuests is anchored on constructivism wherein learners are active participants in the learning process. WebQuests provide learning environments that enhance the learners' curiosity, motivation, and desire to take action towards finding solutions.

Some teachers regard the teaching of conic sections as a rather difficult task. There is little motivation for the intensive study of quadratic relations. The mathematical complexity of the task can likewise be a factor. The second-degree equations of conics are quite difficult and the method of completing the square used to change them into standard form often discourages students. Also, graphing quadratic relations is considerably more complicated than graphing most functions. In addition, a good number of students are lacking in concrete experience with those curves and are relatively unacquainted with their applications (circle is an exception), and therefore consider the learning of this unit as a purely abstract undertaking meant to be endured, and quickly forgotten (Walukiewicz, 2002).

WebQuests present a way to utilize the Internet by consolidating sound learning methodologies. Instead of simply directing learners to websites that may urge them to merely copy and paste, well-organized WebQuests point students to resources in the Internet that oblige them to exercise critical thinking and also to have a more profound comprehension of the topic being investigated on (Unal, Bodur & Unal, 2012).

WebQuests have certain critical elements or key attributes (Dodge, 1997). These elements are introduction, task, information resources, process, guidance, and conclusion as identified by Strickland and Nazzal (2005). The introduction presents the background information needed for the subject matter and setting the stage for the activity. The task explains the activity the students will be working on. Resources are provided to guide the students to web pages that they will use to complete the activity. These resources are placed in the process page. The process gives the student a step-by-step guide on how to finish the activity expected from them. The evaluation tells the students on what is expected from them to be successful in the activity. The conclusion closes the activity and summarizes what the students should have learned after completing the activity (Strickland & Nazzal, 2005).

Steps on how to design a WebQuest are given in the San Diego State University webpage were WebQuests originated (Dodge, 2004). These steps guide educators in developing WebQuests to ensure quality outputs. First, select a topic that requires understanding, makes use of the web well, aligns with curriculum standards, and has been difficult to teach well. Next, pick a design that will fit the selected topic. After that, prepare the task for the students and the curriculum standards for the teacher. Finish the Evaluation section in the student page. Replicate it on the teacher page and include any additional information needed by teachers. Complete the

Process section by looking for an engaging set of resources to give the information needed by learners. Complete the Introduction, Conclusion and Credits section and every other part of the teacher template. Add illustrations or pictures where appropriate (Dodge, 2004).

The researcher took all these factors to account to develop a WebQuest on conic sections. The said WebQuest was validated by experts in the field of math and WebQuests.

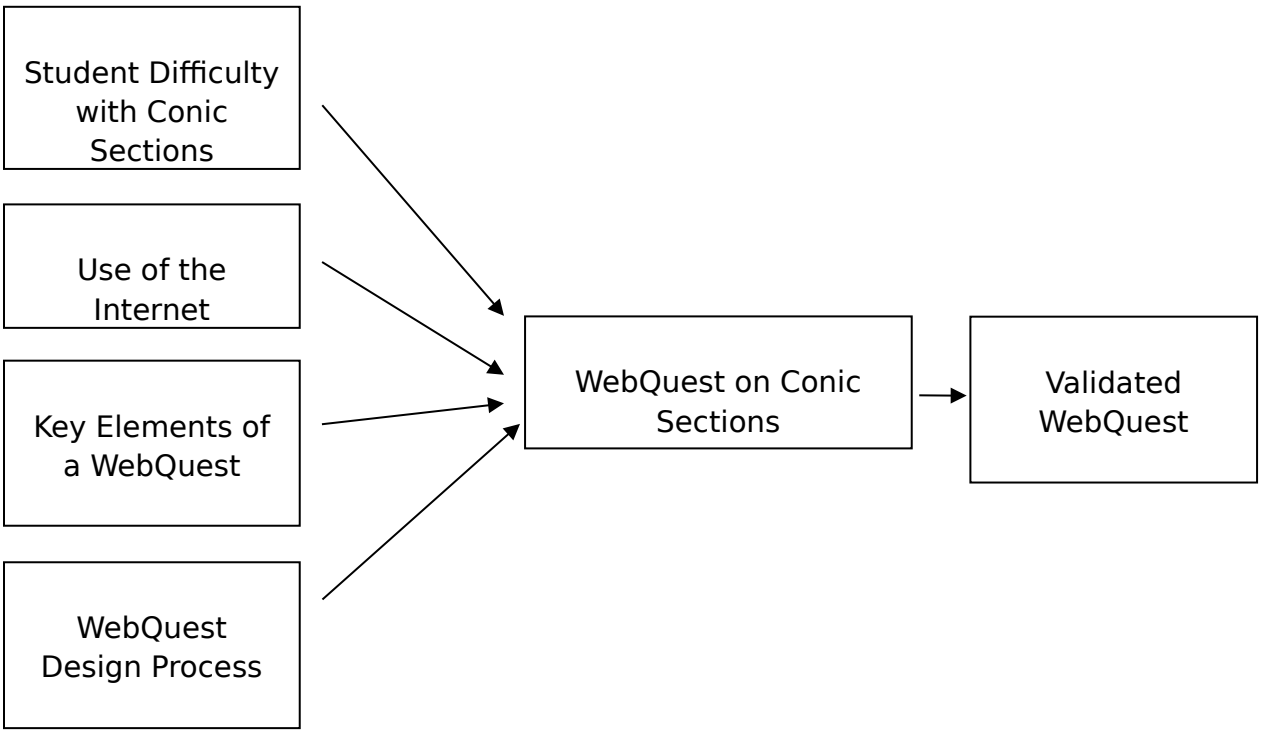

Figure 1. Conceptual Framework of the Study

Figure 1 shows the conceptual framework of the study. The features that lead to the development of the WebQuests are presented. The underlying difficulties that students deal with conic sections were taken to account. The meaningful use of the Internet in learning through a WebQuest as a medium was sought to help with this dilemma. The key elements of a WebQuest

place learners in an interactive learning environment which is based on constructivism. The WebQuest design process position the learner at the center of the instructional process as the tasks for WebQuests are designed. With all these features, the WebQuest on conic sections was completed and was submitted for validation by the experts.

Statement of the Purpose

This study aimed to develop and validate a WebQuest on conic sections.

Specifically, this study aimed to:

1. develop a WebQuest on conic sections;
2. validate the WebQuest with the help of experts in mathematics and educational technology; and
3. evaluate the effectiveness of the WebQuest as perceived by students after using the WebQuest.

Significance of the Study

This study is significant to the following:

Students. They will benefit from the use of a WebQuest in learning conic sections as they will be able to utilize the Internet in a more practical and convenient way through the useful and appropriate links already provided. It will also help them learn the lesson better through authentic tasks and inquiry-based activities.

Mathematics Teachers. They can use the WebQuest in their own classes to facilitate the learning of the students about conic sections. The study will encourage them to create their

own WebQuests based on the needs of their students. Moreover, the result of the study on the perception of the students may aid teachers in deciding on using a WebQuest in class.

School Administrators. They may consider the result of the study in terms of the effectiveness of WebQuests as perceived by the students in the use of the Internet in classroom learning. This will further encourage them to support teachers in developing Internet-based activities towards the enhancement of the learning process.

Future Researchers. They may be able to gather pertinent information that will help them in their study.

Scope and Delimitation of the Study

This study aimed to develop and evaluate a long-term WebQuest on conic sections for 4th year high school students. Experts evaluated the developed WebQuest. This study was conducted during the school year 2014-2015 in San Beda College Alabang. Only the sections in the fourth year taking analytic geometry participated in using the WebQuest in class.

Definition of Terms

For a better understanding of the study, the following terms are defined conceptually and operationally.

WebQuest. It is an inquiry-oriented activity in which some or all of the information that learners make use of come from resources on the Internet (Dodge, 1997). For the purpose of this research, WebQuest refers to a web-based instructional material on conic sections.

Conic Section. It is used to describe all of the possible ways a plane and a double right cone can intersect (Gordon-Holliday, 2004). In this study, it refers to the topic discussed in the WebQuest which will deal with the basic concepts of circles, parabolas, ellipses, hyperbolas, and their graphs.

Development. It refers to the process of designing instructional programs, processes, and products that must meet the criteria of internal consistency and effectiveness (Richey, 1994). In the study, this refers to the process of creating the WebQuest.

Validation. It refers to the evaluation that an instrument or a material is suitable and complete as intended (Cohen, Manion & Morrison, 2000). In the study, this refers to the assessment of the experts on the WebQuest that was developed.

Chapter II

Review of Related Literature

This chapter presents a survey of literature and studies from local and foreign sources that revealed concepts, methods, and findings which are relevant to the present study.

What is a WebQuest?

The web provides many resources for anyone who would like to learn about virtually anything. However, the web is far from being similar to a comprehensive encyclopedia of knowledge. According to March (1998), while both the web and an encyclopedia supply lots of information on various topics, the similarities tend to end there. While an encyclopedia is structured and cross-referenced, the web is unorganized and chaotic. While the content of an encyclopedia is painstakingly researched and aims to provide a bias-free presentation, the web is passionately posted and loaded with opinions and rarely hidden agenda. Finally, an encyclopedia is written by experts, while just about anyone can write a web page.

Educators who aim for their students to utilize the vast resources of the Internet can guide their students on how to evaluate the information in the Internet so they can utilize it for educational purposes.

WebQuests have been around since 1995 after the concept was introduced by Bernie Dodge and Tom March at San Diego State University. According to Dodge (1997), a WebQuest is an inquiry-oriented activity in which some or all of the information that students utilize come from resources on the Internet. It aids students in utilizing the resources on the Internet in a more efficient and meaningful way. A WebQuest activity can be classified based on the duration in

which it will be incorporated into the classroom. A short-term WebQuest is meant to be finished in one to three class periods while the long-term WebQuest may usually take some time between a week and a month in a classroom setting. Moreover, a short-term WebQuest permits students to get the needed web-based information and assist them in combining the gathered information within the assigned course duration. In contrast, a long-term WebQuest allows students to have a significant analysis of the topic and then helps them in applying the learning and understanding to create a tangible product or real-life application (Dodge, 1997).

WebQuests are designed to give students the chance to share real information and consequently lead to meaningful communication. A WebQuest involves cooperation among groups of students using the Internet to be able to collect information and reproduce it in various forms (March, 2003). In a research by Samuda and Bygate (2008), they deemed WebQuest as a web-dependent activity and connected it to task-based teaching method as tasks on an extensive variety of lessons are utilized throughout the curriculum.

Using WebQuest provides the learners the opportunity to be presented to numerous resources without leaving the boundaries of the classroom. With this, Dodge (2006) proposes that students engaging with the use of WebQuests develop a more profound comprehension of the content in contrast to the traditional way of learning.

Creating a WebQuest

Nowadays, a good number of websites such as Create WebQuest (createwebquest.com), Teacher Web (teacherweb.com), and Zunal WebQuest Maker (zunal.com) offer templates and guides to help an educator create a WebQuest. Knowledge in HTML and using HTML editing

software such as Google Web Designer and Microsoft Front Page is no longer imperative. The actual application used to create a WebQuest is not critical; it is the content of the page that matters.

WebQuests should have certain critical elements or key attributes (Dodge, 1997). These elements include an introduction, task, information sources, process, guidance, and conclusion. Some of these attributes commonly include group and motivational activities but these are not essential. Furthermore, WebQuests can be interdisciplinary or within one discipline.

According to Dodge (1997), an introduction is a must in a quality WebQuest for this gives the students background information on the subject matter and sets the stage for the investigation or activity. The introduction should spur the interest of the students to crave and learn more about the topic and explore it in depth.

The succeeding section of the WebQuest is the task. The task must consist of an activity that is attainable and is of interest to the students. According to March (2000), tasks that rely on copying and pasting on the part of the students may result in problems and teachers expecting higher-order thinking outputs might lead to disappointment. Tasks like these undermine the incorporation of the worthy practices educators want to promote. To prevent such a scenario, the task students are to complete should go past reading a text and answering questions afterward.

Peterson and Caverly (2003) expressed that to push learners past basic acquisition of knowledge into the complex universe of numerous texts and main resources, critical thinking must be required by the WebQuest, instead of a scavenger hunt for answers. Moreover, the design of WebQuests should be with the efficient use of the learner's time in mind, to concentrate on utilizing information rather than merely searching for it (Chandler, 2003).

According to Dodge (1997), a quality WebQuest requires thinking skills which include contrasting, categorizing, inducing, deducing, constructing support, making abstractions, and analyzing errors and perspectives. In addition, the task usually provides parts and specific assignments for cooperative group members. Each student is given a role to play as the group finishes the assigned task.

Next, links to high-quality Internet-based sources that the learners will use to finish the activity are given in the resource section. In some WebQuests, the information sources are in a separate section, where the sources are embedded in the WebQuest to point students to information on the Internet (Dodge, 1997). However, what is essential for this section is that the resources are of high quality and developmentally suitable for the target age group. The WebQuest developer should check the credentials of a website before using it as a source.

The process section should give students a step-by-step guide to finish the activity. The WebQuest should present a clear explanation of precisely what students are expected to do to finish the task (Strickland & Nazzal, 2005).

Most quality WebQuests contain an evaluation tool or assessment instrument as the second to the last section. A rubric or checklist form may be used for the evaluation. Since the task includes types of inquiry learning, the traditional paper-pencil type of assessment will not be suitable. The evaluation tool should clearly show to the students precisely what they should do to be successful with the activity (Strickland & Nazzal, 2005).

The last section of the WebQuest is the conclusion. The conclusion leads to the end of the activity and sums up the learning of the students as expected by the teacher as a result of

finishing the activity. The conclusion may also urge students to go beyond the knowledge they gained to other domains (Dodge, 1997).

All these sections taken together should make up a WebQuest that is insightful, fluid, and dynamic (Watson, 1999). Students are encouraged to take part in inquiry learning and are given all the needed resources and assistance to do so. Students know what they are expected to do to be successful in the activity. In addition, they are urged to use their recently acquired knowledge in different contexts (Molebash & Dodge, 2003).

According to Dodge (2004), in designing a WebQuest, the process starts with selecting a topic. The topic should be one that requires understanding, utilizes the web well, fits with curriculum standards, and has been difficult to teach well. Next, choose a design that will be suitable to the topic selected. After that, set up the task for the students and the curriculum standards for the teacher. Finish the Evaluation section in the student page. Replicate it on the teacher page and include any additional information necessary for the teachers. Complete the Process section by looking for an engaging set of resources to give the information needed by the students. Accomplish the Introduction, Conclusion and Credits section and all other parts of the teacher template. Include illustrations or pictures where appropriate (Dodge, 2004).

Evaluation of a WebQuest

Thousands of WebQuests are available in the Internet for teachers to use though the quality of these WebQuests varies. In a good number of cases, some of them may not even be considered as real WebQuests (March, 2003). March (2003) stressed that a good WebQuest must

be able to incite the sudden moment of realization of understanding that lie at the center of authentic learning.

In the study conducted by Unal, Bodur & Unal (2012), they discussed that even though WebQuests present promising possibilities for improving student learning and motivation, the outcome of utilizing WebQuests as teaching and learning devices may rely on how well they are designed in the first place. Anybody with the right applications can design and publish a WebQuest on the Internet. While articles from journals and books undergo reviews and editing, WebQuests may not be subjected to any formal evaluating process at all. As a result, there is a great number of WebQuests available online, which results to difficulty in choosing high-quality from low-quality WebQuests. It is therefore essential that thorough evaluation of WebQuest design be done in opting to use a WebQuest. The structure of rubrics makes one a powerful tool to evaluate the quality of WebQuests (Unal, Bodur & Unal, 2012).

Rubrics are scoring devices that enable teachers to evaluate various parts of multifaceted performances or outputs based on different levels of achievement factors. A rubric informs both instructors and students what is deemed essential when evaluating (Arter & McTighe, 2001).

In the case of a rubric for evaluating WebQuests, there are four widely used rubrics. One was developed by Dodge (1997), where he named six critical attributes for a WebQuest. This was then modified and converted to a WebQuest evaluation rubric (Bellofatto, Bohl, Casey, Krill, & Dodge, 2001). Another rubric for evaluating WebQuests was created by March (2003), the co-developer of the WebQuests strategy. It is called a WebQuest Assessment Matrix and has eight criteria: Engaging Opening/Writing, the Question/Task, Background for Everyone, Roles/Expertise, Use of the Web, Transformative Thinking, Real World Feedback, and Conclusion (March, 2003). The enhancing Missouri's Instructional Networked Teaching Strategies (eMINTS, 2006) National Center also designed a rubric which they based on Dodge's

work. Unal, Bodur & Unal (2012), the creators of Zunal.com, designed a rubric in evaluating WebQuests, and investigated the reliability of the rubric as well. The rubric was based on three other widely-used rubrics. These rubrics were those created by Bellofatto, Bohl, Casey, Krill, & Dodge (2001), March (2003), and eMints (2006). Changes were made based on the observations given in the literature and feedback obtained from the teachers (Unal, Bodur & Unal, 2012).

The main purpose of WebQuest design evaluation rubrics is to assist teachers in selecting high quality WebQuests from the thousands of available WebQuests online. This evaluation must be reliable, dependable, and grounded on proof (Wiggins, 1998).

Impact of WebQuests

WebQuests have been around now for more than twenty years. It is common enough that thousands of WebQuests are available on the Internet, yet, still unconventional in the average Filipino classroom. Studies regarding the use and impact of WebQuests have been done but there is virtually close to none in its use in teaching mathematics.

Pre-service mathematics students, who participated in the study of Halat and Jakubowski (2001), gave favorable feedback and showed interest in considering the use of WebQuests as a substitute for textbooks and traditional teaching. They believe that this technique let students use geometric ideas in real-world applications with the use of technology (Halat & Jakubowski, 2001).

Studies have shown that the main advantage of using a WebQuest is the motivation it elicits from the learners. It has been shown that WebQuests can positively affect students' motivation and are often favored by students (Abbit & Ophus, 2008).

In a study by Segers and Verhoeven (2009), they investigated the effects on learning in a sheltered Internet environment using WebQuests in elementary school classrooms in the Netherlands. The learning gains and quality of the work of 229 sixth graders participating in

either a free-search Google condition or a closed-search WebQuest condition were compared. The closed-search condition showed the highest learning gains for boys. This shows that a WebQuest help students utilize the Interne better in contrast with a free reign use.

In a case study conducted in a private school in the Philippines, Auditor (2011) used six WebQuests in his class that lasted for almost 5 months. The result of the study showed that there was in general an increase in the group scores of the students. Also, the study demonstrated that students view WebQuests well regardless of their learning ability implying that the WebQuest is a useful device for learning Physics. The exposure to the WebQuest model improved the critical thinking of students and promoted the students' performance in content-knowledge acquisition (Auditor, 2011).

Chang, Chen, and Hsu (2011) conducted a study on integrating WebQuest with mobile learning for environmental education. The study showed that while WebQuest on its own is beneficial in the learning of the students, using WebQuest in outdoor instruction influences students' learning performance positively. Moreover, when WebQuest was used in real situations, students could acquire more knowledge and experiences, and in the learning activity of the experiment, the students accomplished different learning tasks and expressed their own opinions and perspectives, which could foster their critical thinking skills (Chang, Chen & Hsu, 2011).

In the field of language learning, a number of studies have shown that the use of WebQuests improves student learning and achievement. In a study conducted among Saudi male EFL students' reading comprehension performance, Alshumaimeri and Almasri (2012) found that there was a notable increase in the score of the research participants in the control and the experimental group in reading comprehension. Still, the highly significant difference in the experimental group's post-test comprehension performance in contrast to the pre-test shows that the use of WebQuest can enhance the reading comprehension performance of students. Similar

results were yielded in a study by Tsai (2006) wherein WebQuests were used by Taiwanese EFL university students. WebQuests were utilized to make the regular reading instruction method in EFL reading courses more engaging. It was found that students dealing with WebQuests considerably performed better than those in the control group in both story reading comprehension and vocabulary learning.

Halat's (2013) study dealt with the experience of elementary school students in using WebQuests. The study found that the use of WebQuests motivated primary school students to learn more. Majority of the students from the 4th and 5th grade (71%) offered favorable feedback to the utilization of the WebQuests. Sixty-four percent of the students confirmed that they enjoyed the use of this innovative technique in teaching and learning.

However, several studies did not result in a good number of significant advantages on the use of WebQuests as an instructional tool in terms of students' learning and achievement.

In a study by Strickland and Nazzal (2005), 86 seventh-grade students who worked on either a conventional poster exercise or a WebQuest exercise on the history of Texas were compared. The groups that worked on the conventional exercise scored significantly higher than the WebQuest group on a unit exam.

In an experimental study conducted by Gaskill, McNulty, and Brooks (2006), they compared a control group that used traditional teaching strategies with an experimental group that utilized WebQuests. Gaskill et al. (2006) found that the control group performed better compared to the WebQuest group using pre and posttest measures of history.

In addition, the results found by Burke, Guffey, Colter, and Riehl (2003) in their own research showed that there was no significant difference found among groups of tertiary students in an introduction to biology course that utilized either WebQuest or traditional methods.

Difficulties were faced by students in using Jigsaw Cooperative Approach (JCA) and the Traditional Cooperative Approach (TCA) within the context of a WebQuest science investigation (Zacharias, Nikoletta & Constantinos, 2011). The students found it difficult to teach topics they solely studied in spite of the WebQuest.

Synthesis of the Study

Ever since Internet became accessible to the public, educators have been looking for ways to incorporate it in the classroom. Dodge and March developed the WebQuest in 1995 so that the vast resources available in the Internet can be utilized more efficiently in the classroom. For a WebQuest to be effective, key elements are required and certain steps are to be followed in developing one.

The effect on teaching and learning of using WebQuests relies on the design of the WebQuest itself. To ensure the quality of a WebQuest, rubrics are used to judge its quality. Several rubrics are widely used to evaluate WebQuests. These are the rubrics made by Bellofatto, Bohl, Casey, Krill, and Dodge (2001), March (2003), the enhancing Missouri's Instructional Networked Teaching Strategies National Center (2006) which was based on Dodge's work, and the rubric developed by the creators of Zunal.com, Unal, Bodur and Unal (2012). The one from Zunal.com was created by using the strong points of the three other commonly-used rubrics wherein improvements were based on the feedback from educators and comments gained through the literature (Unal, Bodur & Unal, 2012).

Studies have shown that the use of WebQuests in the classroom motivates the students to learn (Abbit & Ophus, 2008). Also, studies by Tsai (2006), Auditor (2011), and Alshumaimeri and Almasri (2012) showed that the use of WebQuest has a positive effect on the achievement and thinking skills of the students. In addition, the study of Chang, Chen, and Hsu (2011)

showed that the use of WebQuest along with outdoor instructions yielded an even more positive result.

However, this is in contrast with the results of the studies by Burke, Guffey, Colter, and Riehl (2003), Strickland and Nazzal (2005), and Gaskill, McNulty, and Brooks (2006) wherein the use of WebQuest did not reveal any advantages in terms of the learning and achievements of the students. Difficulties may also be encountered by students when using the WebQuest (Zacharias, Nikoletta & Constantinos, 2011).

In the field of mathematics education, there is very little available resources on the effect of using WebQuest in the classroom. Halat and Jakubowski (2001) had a study wherein 19 pre-service secondary and middle school mathematics teachers were introduced to WebQuests and were divided into four groups with each group tasked to create their own WebQuest. All four groups gave favorable feedback and showed interest in considering the use of WebQuests as a substitute for textbooks and traditional teaching (Halat and Jakubowski, 2001). The researcher did not find any study that specifically deals with the development and validation of a WebQuest in math or one that tackles the effect of using a WebQuest in teaching mathematics.

The literature and related studies gathered by the researcher discussed what WebQuests are, as well as the creation and evaluation of such materials. Based on the findings, at the very least, the use of WebQuests has positive effects on the motivation of the students to learn.

In the light of these findings, the researcher aimed to develop a WebQuest in mathematics that specifically deals with conic sections to provide a web-based instructional material for teachers and students. The study also attempted to determine the effectiveness of the use of WebQuest in math as perceived by students. This study may serve as a source for future studies on WebQuest in mathematics teaching and learning.

Chapter III
Research Methodology

This chapter discusses the research design, respondents of the study, research instrument, procedure, treatment of data and statistical instruments that will be used in this study.

Research Design

The main objective of this study is to develop and evaluate a WebQuest on conic sections. Thus, the researcher used the descriptive-developmental method.

Four phases were undertaken in this study, namely: Preparation Stage, which involved the reading of books and other reference materials that were deemed useful for the WebQuest. The Development Stage included creating the WebQuest by following the steps in the WebQuest design process provided in the San Diego State University homepage. The WebQuest is a long-term type. In the Validation Stage, mathematics experts and educational technology experts were asked to evaluate the developed WebQuest. Final revisions were made based on the feedback from experts. Finally, in the Try-Out Stage, the WebQuest was used as an actual class activity for six class meetings. Students who used the WebQuest also evaluated the WebQuest based on their perception.

Research Participants

The participants of the study were selected Fourth year students from San Beda College Alabang. Only two sections, both with 46 students, in the Fourth year level took the subject Analytic Geometry thus, the WebQuest was used by the students from these two sections.

Validation Procedure

The researcher formally asked the help of individuals who are considered experts in teaching mathematics and/or WebQuests in validating the content and suitability of the designed WebQuest. Three experts were asked to evaluate the WebQuest. The experts were the head of Philippine Normal University - School of Information Knowledge Management [PNU - SIKM], a mathematics professor at Philippine Normal University - Manila, and a professor at Philippine Normal University - Institute of Teaching and Learning [PNU - ITL] who wrote a paper on WebQuests. Each evaluator received the complete hardcopy of the WebQuest made, including the student and teacher page. The web-address of the WebQuest was also provided. Along with the WebQuest was the evaluation tool adapted from the Zunal.com (ZUNAL WebQuest Rubric (Final Version), 2012). The evaluation tool can be seen in Appendix A. After the validation process, the researcher tallied the responses of the evaluators. The goal was for the WebQuest to get an "Acceptable" rating.

Data Gathering

The researcher also let the student participants evaluate the WebQuest by letting them answer a questionnaire adapted from the study Student Feedback on the Effectiveness of Using a WebQuest for an Integrative Skills Course in a Korean University (Kobylinski, 2014). This can be seen in Appendix B. The questionnaire was modified to suit the purpose of the study. The

questionnaire was administered to all the students who participated in the WebQuest activity. The questionnaire consisted of six questions; each question used a four-point scale. Students were encouraged to include their own personal comments after the six questions.

The data of the study was collected from the two fourth year sections who took analytic geometry in San Beda College Alabang during the school year 2014-2015. The school is owned and run by the Benedictine Community.

Statistical Analysis of Data

For the evaluation of the WebQuest by the experts, the researcher got the average rating for each of the nine categories from each expert. This helped identify if the WebQuest received an average less than "Acceptable" for any of the categories. The over-all mean was also determined.

To be able to interpret and describe the per item ratings of the items in the rubric, the per evaluator rating, as well as the over-all rating, the following ranges of the mean ratings and their corresponding interpretations shown in table 1 were utilized. The 3-point response scale including unacceptable, acceptable, and target was adapted from ZUNAL WebQuest Rubric by Unal, Bodur and Unal (2012). The range for the mean rating was distributed in such a way that the ratings were distributed equally.

Table 1

Interpretation of Evaluation Rubric's Ratings

Point	Mean Rating	Interpretation

3	2.35 - 3.00	Target
2	1.68 - 2.34	Acceptable
1	1.00 - 1.67	Unacceptable

For the perception of the student participants, the researcher got the average rating for each of the six questions. The per item rating of the items in the questionnaire, as well as the over-all rating were interpreted by using the following scale shown in table 2. The adapted questionnaire used by Kobylinski (2014) used a five-point scale. However, to align with the current norms in research, the researcher used a four-point scale and excluded a "neither agree nor disagree" option. The range for the mean rating was distributed in such a way that the ratings were distributed equally.

Table 2

Interpretation of Student Questionnaire's Ratings

Point	**Mean Rating**	**Interpretation**
4	3.25 - 4.00	Strongly agree
3	2.50 - 3.24	Agree
2	1.75 - 2.49	Disagree
1	1.00 - 1.74	Strongly disagree

Chapter IV

Presentation, Interpretation, and Analysis of Data

This chapter presents the development, validation and evaluation of the developed WebQuest in conic sections. This shows the content of the developed WebQuest with a description of each section. The result of the validation by the experts and the evaluation by the students are also presented and discussed.

Overview of the Developed WebQuest on Conic Sections

This WebQuest was made with the ideals of constructivism as its anchor. At the heart of constructivism is the statement that an individual plays a dynamic role in the learning process, and does not just receive facts passively. Therefore, it is essential that teachers must prepare environments for learning that develop the curiosity, motivation, and the desire of the learners to search for answers and solutions (Tobias & Duffy, 2009). This is what the developed WebQuest provides – an environment for students to learn about conic sections and use this learning to accomplish the task. The WebQuest let the learners participate actively in the learning process by giving them the freedom to learn about conic sections at their own pace. They are given very few restrictions to accomplish the task given to them. To accomplish the task, in this case, the shirt design formed by using equations, require them to think critically, create using the knowledge they acquired, and participate actively. The WebQuest also requires from the students to work

collaboratively in groups and are expected to perform assigned tasks for groups to finish the activity satisfactorily. Constructivism really is the principal theory behind WebQuests, and the developed WebQuest demonstrates this.

The developed WebQuest contains key elements of a WebQuest as well as additional elements to enhance it. The first page of the WebQuest shows the user the welcome page. The page contains the title of the WebQuest, a short description, the target grade level, keywords and the author. Figure 2 shows the welcome page. The title of the WebQuest is Conic Shirt Design Art and its target grade levels are those from grades 9 to 11. The researcher gave this description for the WebQuest: In this WebQuest, students will use math to create their own graphic t-shirt designs. This WebQuest will introduce students to conic sections graphically and will help them develop an understanding of circles, parabolas, ellipses and hyperbolas. A hardcopy of the WebQuest is provided in Appendix D.

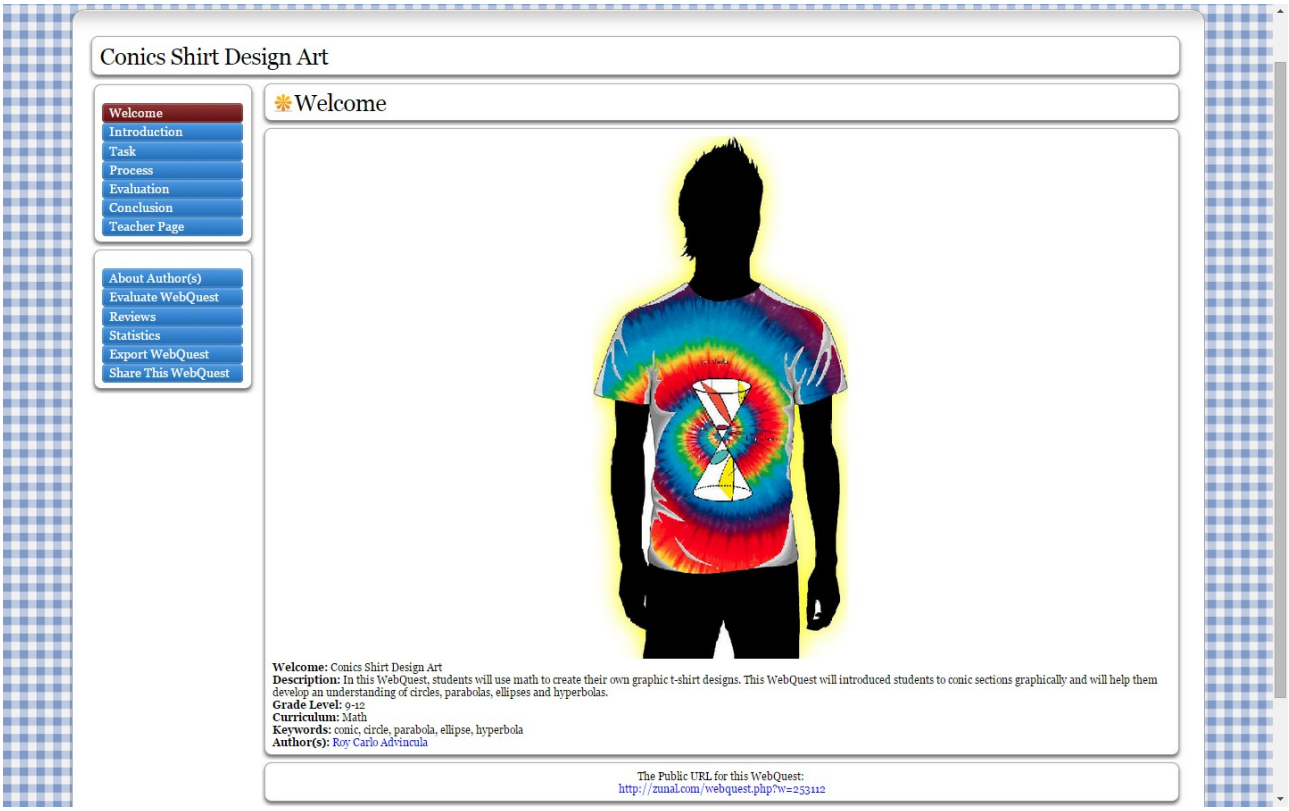

Figure 2. Welcome Page

The introduction page is the first key element of a WebQuest and it gives background information on the subject matter and sets the stage for the activity or investigation. In the WebQuest on conic sections, the students are introduced to the idea of using the graphs of conic sections in graphic designs. The novelty that students will come up with their own graphic design is used as a motivation for them to be interested with conic sections, specifically the graphs. Figure 3 shows the introduction page.

Figure 3. Introduction Page

The task page gives a quick overview of the activity the students will have to do. The students are expected to learn about conic sections through research and online tutorials, and use the knowledge they gained to use the graphs of conic sections to form their graphic design. Desmos, the online calculator the students will use, is also introduced. A link to the online graphing calculator is provided along with a short tutorial video on how it is used. The task page provides a constructive environment where the students can develop their skills in equations. Figure 4 shows the task page.

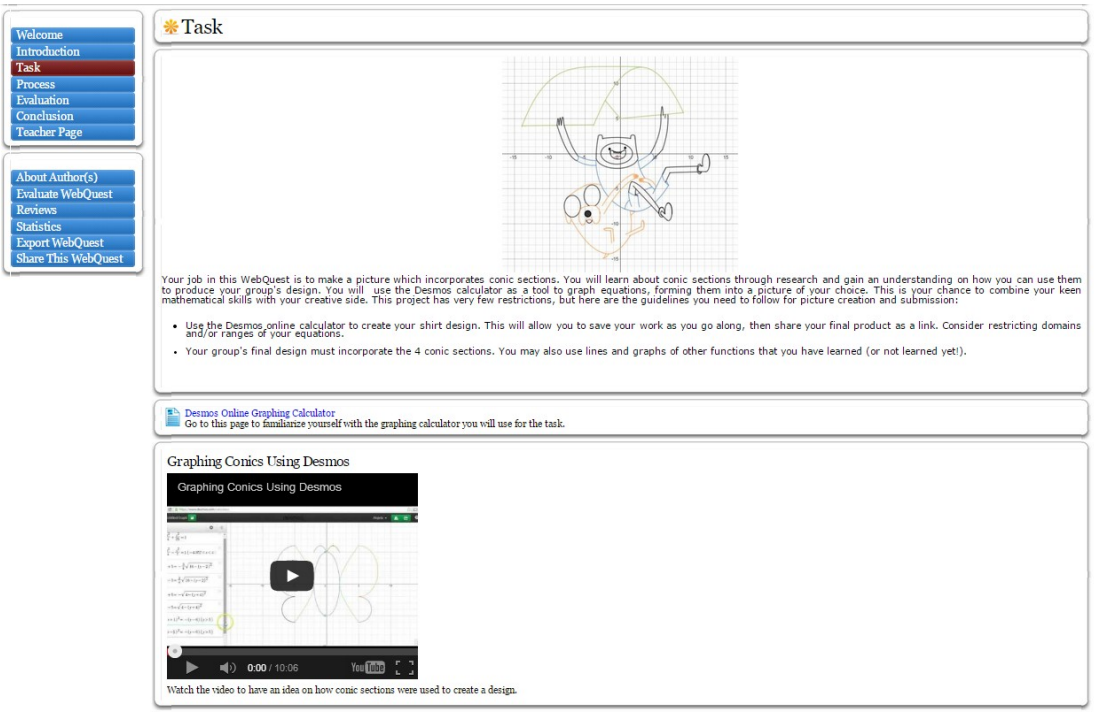

Figure 4. Task Page

The process page contains the detailed guide of the activity the students are expected to accomplish. The resources are given in the process page as well. Exercises to prepare the students for the main task are included in this page. A learning environment anchored in constructivism is setup for the students in the process page. The students will have to be responsible and active in their learning by utilizing the resources provided to learn about conic sections. They will have to think critically and be able to use the knowledge they have acquired to accomplish the task at hand. Collaboration is an important key for them to perform the challenges and to be able to come up with a good output. Figure 5 shows the process page.

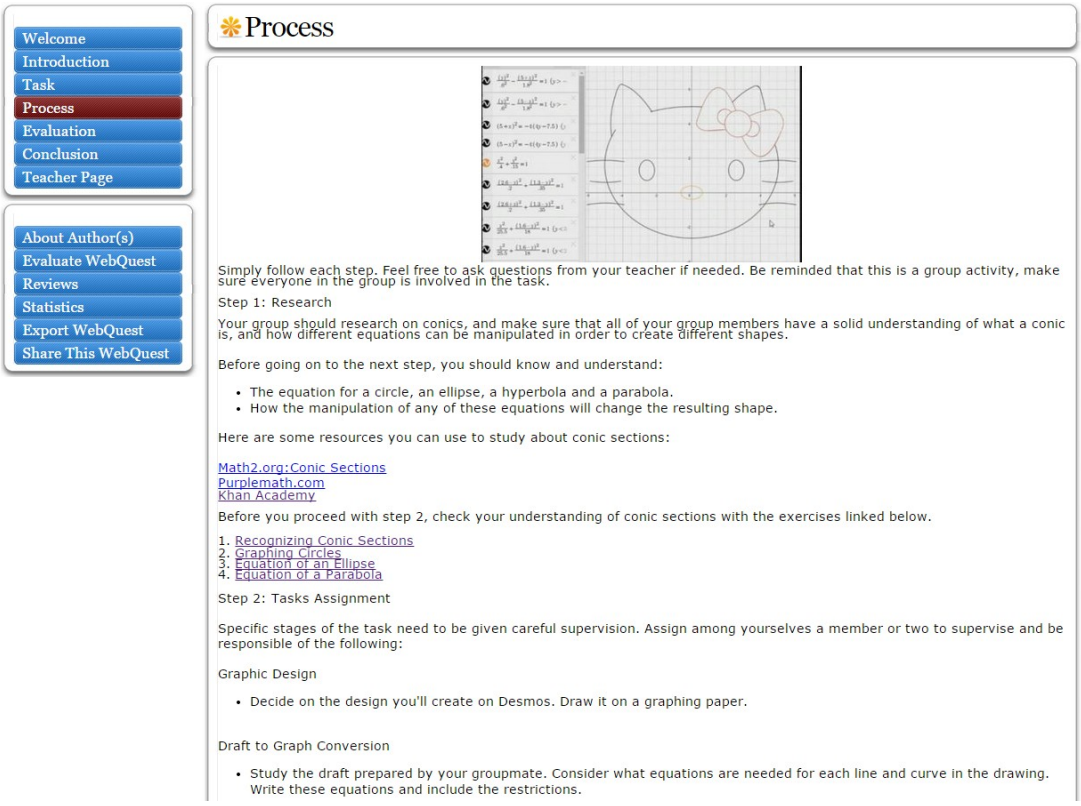

Figure 5. Process Page

The evaluation page gives the student the rubric that will be used to evaluate their work. Figure 6 shows the evaluation page.

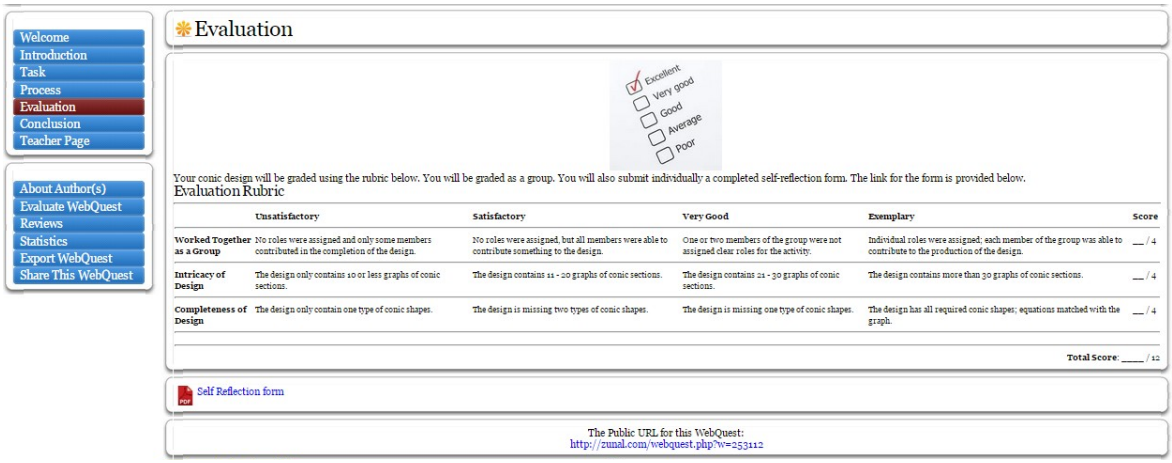

Figure 6. Evaluation Page

The conclusion page summarizes what the students were expected to learn. A link to more challenging lessons is given for students who wish to explore the topics of conic sections more. Figure 7 shows the conclusion page.

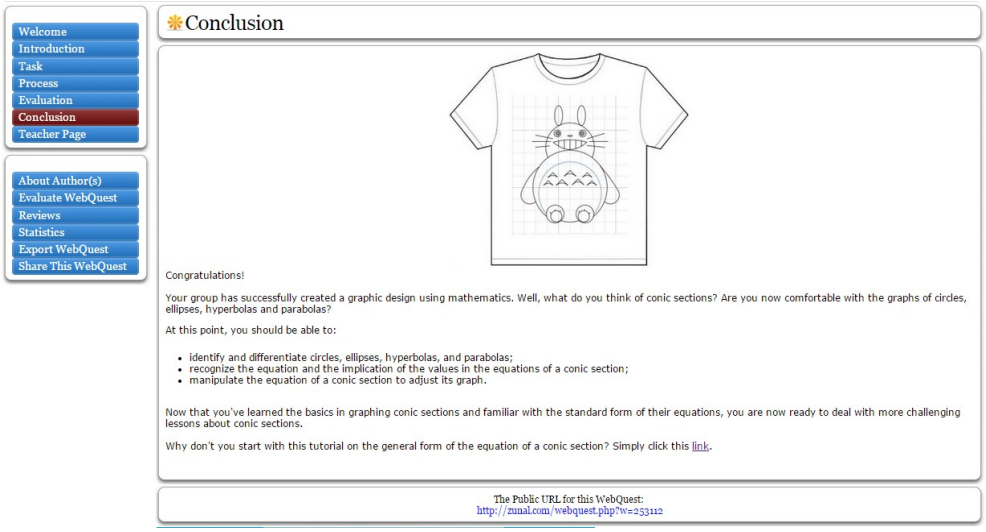

Figure 7. Conclusion Page

A teacher page is also provided to give teachers an overview of the WebQuest. Credits to the image sources are also given in this page. Figure 8 shows the teacher page.

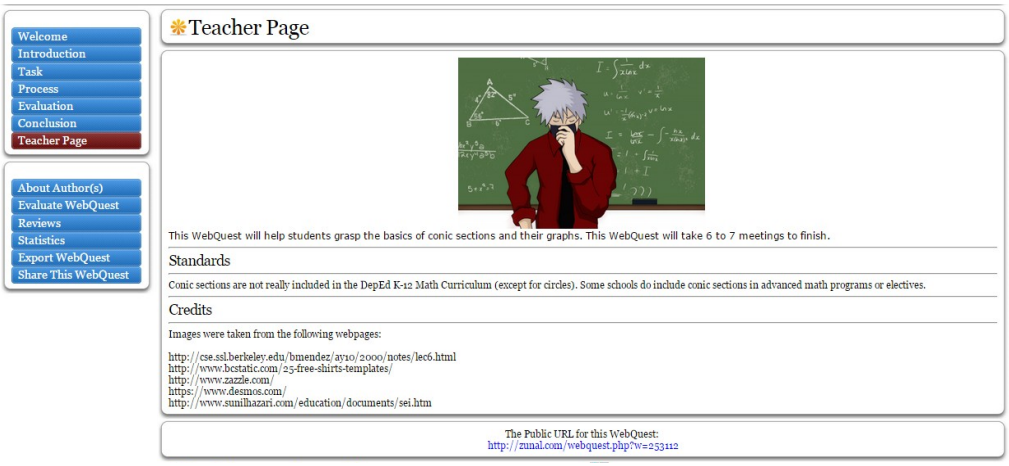

Figure 8. Teacher Page

Validation of the Developed WebQuest on Conic Sections

The WebQuest was validated by the evaluators using the rubric adapted from Zunal.com (ZUNAL WebQuest Rubric (Final Version), 2012). Table 3 shows the average rating given by the evaluators.

Table 3

Average Rating of Evaluators' Responses

Categories	Average	Verbal Interpretation
Title Page		
• Title	2.67	Target
• Description	3.00	Target
• Grade Level	2.67	Target
• Keywords	3.00	Target
Introduction		
• Motivational Effectiveness of Introduction	2.33	Acceptable
Task		
• Clarity of Task	3.00	Target
• Cognitive Level of Task	3.00	Target
• Cognitive Level of Learners	3.00	Target
Process		
• Clarity of Process	2.33	Acceptable
• Scaffolding of Process	2.67	Target
• Collaboration	2.00	Acceptable
Resources		
• Relevance and Quality of Resources	2.33	Acceptable
• Quality of Resources	2.67	Target
• Organization of Resources	2.67	Target
Evaluation		
• Clarity of Evaluation	2.67	Target
• Relevancy of Evaluation	3.00	Target
Conclusion		
• Summary	2.00	Acceptable
• Further Study and Transformative Learning	2.33	Acceptable
Teacher Page		
• Standards	2.67	Target
• Credits	2.33	Acceptable
Overall Design		
• Use of Graphics	3.00	Target
• Spelling and Grammar	3.00	Target
• Consistent Look and Feel	3.00	Target
• Working Links and Use of Tables	2.67	Target
Overall Mean Rating	2.67	Target

Using the mean rating and interpretation presented in chapter three where a mean rating of 2.35 - 3.00 is interpreted as Target and 1.68 - 2.34 is Acceptable, the table shows that the WebQuest generally received a weighted average that falls under Target for most of the items and Acceptable for all the remaining items, suggesting that the WebQuest generally received a positive response from the evaluators. The evaluator used a 3-point scale: 1- Unacceptable, 2- Acceptable, 3- Target.

All four items in the Title Page category have reached a mean rating that fall under Target. An Acceptable mean rating was garnered in the Introduction category.

The items under the Task category received average ratings of 3.0 and are all within Target. This shows that the evaluators deem that the task given in the WebQuest met the expected constructivist approach in any WebQuest.

Two of the three items under Process received a mean rating within Acceptable and one item got a Target mean rating. It was Scaffolding of Process that received a Target mean rating supporting the constructivist nature of the WebQuest.

For Resources, one item received an Acceptable mean rating while the two other items fall within Target mean rating. Both items under Evaluation are within Target while both items under Conclusion are within Acceptable. For the Teacher Page, one item received a Target mean rating while the other one received Acceptable.

All four items under Overall Design fall within Target mean rating. Some minor changes in the design were recommended by the experts as well as some additional content in some of the

pages. These recommendations were incorporated in the final version of the WebQuest. The overall mean rating for the WebQuest is 2.67 which safely puts the WebQuest under Target.

Effectiveness of the WebQuest as Perceived by Students After Using the WebQuest

The perceptions of the students on the effectiveness of the WebQuest were gathered using a questionnaire adapted from the study Student Feedback on the Effectiveness of Using a WebQuest for an Integrative Skills Course in a Korean University (Kobylinski, 2014).

Table 4

Average Rating of the Students' Responses

Statements	Average Weighted Mean	Verbal Interpretation
1. I learned how to graph conic sections and manipulate their equations during the WebQuest.	3.30	Strongly Agree
2. The WebQuest was very clear to me.	3.23	Agree
3. I enjoyed using the WebQuest.	3.28	Strongly Agree
4. The WebQuest used in class was effective in teaching me the lesson on conics.	3.41	Strongly Agree
5. The format of the WebQuest engaged me in the task.	3.28	Strongly Agree
6. All in all, I learned a lot through the use of the WebQuest.	3.41	Strongly Agree
Overall Rating	3.32	Strongly Agree

Using the mean rating and interpretation presented in chapter three where a mean rating of 3.25 - 4.00 is interpreted as Strongly Agree and 2.50 - 3.24 is Agree, the table shows that five of the six items in perception of the students received weighted averages that fall under Strongly Agree. This may indicate that the WebQuest was perceived by the students as very effective in their study of conic sections. Only the item *The WebQuest was very clear to me* received a weighted average of 3.23 which almost reached the Strongly Agree mark but not quite. It falls under Agree which still implies a favorable response from the students. This may also mean that the researcher should consider how to make the WebQuest clearer to the students.

The over-all rating of 3.32 in the evaluation of the effectiveness of the WebQuest as perceived by the students can be considered as a very favorable result since this is interpreted as Strongly Agree. The students learned the objective of the lesson and found the WebQuest effective. They also found the WebQuest enjoyable and engaging.

Chapter V

Summary, Conclusions, and Recommendations

This chapter presents the summary, findings, conclusions, and recommendations of the study based on the statement of purpose in Chapter 1.

Summary

The purpose of this study was to develop and validate a WebQuest on conic sections.

Specifically, it aimed to:

1. develop a WebQuest on conic sections;
2. validate the WebQuest with the help of experts in mathematics and educational technology; and
3. evaluate the effectiveness of the WebQuest as perceived by students after using the WebQuest.

The researcher developed the WebQuest based on the key elements presented by Dodge (1997) while following the steps in the WebQuest design process provided by the WebQuest homepage of San Diego State University. The WebQuest was uploaded in zunal.com, following the template provided by the WebQuest hosting page.

After the development of the WebQuest, it was validated by three experts in either WebQuests or teaching mathematics. The validation data were tabulated and the recommendations were incorporated in the revised WebQuest. The experts gave the WebQuest an

overall rating within the Target rating which is higher than the Acceptable rating aimed by the researcher.

The validated WebQuest was used in the researcher's class where the student participants were asked to evaluate its effectiveness based on their perception. The WebQuest generally received a positive response with an over-all rating of 3.32 with 5 being the highest rating in the evaluation as perceived by the students.

Conclusions

Based on the result of the study, the following conclusions were drawn:

1. The developed WebQuest on conic sections can be used in classroom instruction. The WebQuest has been deemed effective in guiding students to the right concepts. Experts have validated the appropriateness of the WebQuest with respect to its content, design characteristics, clarity, and learning activities. It promotes a constructivist learning environment through its interactive and collaborative activities.
2. WebQuests, if found suitable for use, are effective in engaging students in learning mathematics. Students find it enjoyable and effective to learn with the use of WebQuest in class.

Recommendations

Recognizing the strength and limitations of the study, the researcher hereby forwards the following recommendations:

1. Teachers of mathematics may consider developing WebQuests that specifically suit the instructional needs of their students.
2. The WebQuests developed in this study may be used by teachers when discussing conic sections.
3. The WebQuest developed in this study may be tried out to students to determine the effect of the use of WebQuest in the understanding of math concepts.
4. Other researchers may develop WebQuests that will utilize technology in the classroom and conduct an experimental study to determine the effect/s of WebQuests in the students' learning of math concepts.

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Appendix A

Evaluation Tool Adapted from Zunal.com

Conic Shirt Designs

by

Roy Carlo Advincula

WebQuest Description: This WebQuest is designed to guide students in learning the basics of conic sections and their graphs.

Grade Level: Grade 9 - 11

Evaluation Details

Evaluated By:
Evaluated On:

Title Page	Unacceptable (1)	Acceptable (2)	Target (3)	Score
Title	No title given for the webquest, or selected title is completely irrelevant to the webquest.	Title is given for the webquest, and somewhat relevant to the topic.	Title is given for the webquest, and very relevant to the topic.	
Description	No description given for the webquest, or description is completely irrelevant is very brief.	Webquest description is provided but does not provide adequate summary of webquest.	Webquest description provides a detailed summary of webquest.	
Grade Level	No grade level range is assigned to this webquest, or selected grade level is not appropriate for the webquest.	Grade level range is selected for the webquest and somewhat appropriate for the webquest.	Grade level range is selected for the webquest and very appropriate for the webquest.	
Keywords	No keywords are provided for this webquest, or selected keywords are irrelevant to the webquest.	Keywords are provided for this webquest, and selected keywords are somewhat relevant to the webquest.	Keywords are provided for this webquest, and selected keywords are very relevant to the webquest.	

Comments for **Title Page**

Introduction	Unacceptable (1)	Acceptable (2)	Target (3)	Score
Motivational Effectiveness of Introduction	Introduction is purely factual, with no appeal to learners' interest or a compelling question or problem.	Introduction relates somewhat to the learners' interests and/or describes a compelling question or problem.	Introduction draws the reader into the lesson by relating to the learners' interests or goals and engagingly describes a compelling essential question or problem.	

Comments for **Introduction**

Task	Unacceptable (1)	Acceptable (2)	Target (3)	Score
Clarity of Task	After reading the task, it is still unclear what the end/culminating project of the webquest will be.	The written description of the task adequately describes the end/culminating project, but does not engage the learner.	The written description of the end/culminating product describes clearly the goal of the webquest.	

Task	Unacceptable (1)	Acceptable (2)	Target (3)	Score
Cognitive Level of Task	Task does not require synthesis of multiple sources of information (transformative thinking). It is simply collection of information or answers from web.	Task requires synthesis of multiple sources of information (transformative thinking) but is limited to in its significance and engagement.	Task requires synthesis of multiple sources of information (transformative thinking) and it is highly creative, goes beyond memorization, and engaging.	
Cognitive Level of Learners	Task is not realistic, not doable, and not appropriate to the developmental level and other individual differences (age, social/culture, and individual differences) of students with whom the webquest will be used.	Task is realistic, doable, but limited in its appropriateness to the developmental level and other individual differences (age, social/culture, and individual differences) of students with whom the webquest will be used.	Task is realistic, doable, and appropriate to the developmental level and other individual differences (age, social/culture, and individual differences) of students with whom the webquest will be used.	

Comments for **Task**

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Process	Unacceptable (1)	Acceptable (2)	Target (3)	Score
Clarity of Process	Process page is not divided into sections or pages where each group/team or student would know exactly where they were in the process and what to do next. Process is not clearly organized.	Process page is divided into sections or pages where each group/team or student would know exactly where they were in the process and what to do next. Process is organized with specific directions that also allow choice/creativity.	Process page is divided into sections or pages where each group/team or student would know exactly where they were in the process and what to do next. Every step is clearly stated.	
Scaffolding of Process	Activities are not related to each other and/or to the accomplishment of the task.	Some of the activities do not relate specifically to the accomplishment of the task.	Activities are clearly related and designed from basic knowledge to higher level thinking.	
Collaboration	The process provides only few steps, no collaboration or separate roles required.	Some separate tasks or roles assigned. More complex activities required.	Different roles are assigned to help students understand different perspectives and/or share responsibility in accomplishing the task.	

Comments for **Process**

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Resources	Unacceptable (1)	Acceptable (2)	Target (3)	Score
Relevance and Quality of Resources	Resources (web links, files etc.) are too limited, too many and/or too irrelevant for students to accomplish the task.	Resources (web links, files etc.) are sufficient but some resources are not appropriate (do not add anything new or contains irrelevant resources).	There is a clear and meaningful connection between all the resources and the information needed for students to accomplish the task. Every resource carries its weight.	
Quality of Resources	Resources (web links, files, etc.) do not lead to credible/trustable information. They do not encourage reflection such as interactivity, multiple perspectives, multimedia, current information such as use of googlemap, interactive databases, timelines, photo gallery, games/puzzles etc.	Resources (web links, files, etc.) are credible but they only provide facts. They do not encourage reflection such as interactivity, multiple perspectives, multimedia, current information such as use of googlemap, interactive databases, timelines, photo gallery, games/puzzles etc.	Resources (web links, files, etc.) are credible and provide enough meaningful information for students to think deeply with interactivity, multiple perspectives, multimedia, current information such as use of googlemap, interactive databases, timelines, photo gallery, games/puzzles etc.	
Organization of Resources	Resources are not organized or listed in a meaningful way (by topic, section, group or individual task). They are rather thrown all over with no reference. Students would not know exactly what resources are for what purposes (no description, or labels).	Resources are organized/listed in a meaningful way (by topic, section, group or individual task) but still some students might be confused as to know exactly what resources are for what purposes (no description, or labels given for each resource).	Resources are organized/listed in a meaningful way (by topic, section, group or individual task). Students would know exactly what resources are for what purposes (description, or labels given for each resource).	

Comments for **Resources**

Evaluation	Unacceptable (1)	Acceptable (2)	Target (3)	Score
Clarity of Evaluation	Criteria for success are not described. Students have no idea how they or their work will be evaluated/judged.	Criteria for success are stated but webquest does not apply multiple assessment strategies (use of rubric or checklist, reflection of project, pre-post assessments, quiz etc.).	Criteria for success are clearly stated and webquest applies multiple assessment strategies (use of rubric or checklist, reflection of project, pre-post assessments, quiz etc.).	
Relevancy of Evaluation	No connection between the learning goals and standards to be accomplished at the end of webquest and evaluation process. The evaluation instruments does not measure what students must know and be able to do to accomplish the task.	Limited connection between the learning goals and standards to be accomplished at the end of webquest and evaluation process. The evaluation instruments does not clearly measure what students must know and be able to do to accomplish the task.	Strong connection between the learning goals and standards to be accomplished at the end of webquest and evaluation process. The evaluation instrument clearly measures what students must know and be able to do to accomplish the task.	

Comments for **Evaluation**

Conclusion	Unacceptable (1)	Acceptable (2)	Target (3)	Score
Summary	No conclusion is given to present a summary of what was/were learned at the end of the activity or lesson.	Conclusion is given but does not give enough information of what was/were learned at the end of the activity or lesson.	Conclusion is given but with detailed information of what was/were learned at the end of the activity or lesson.	
Further Study and Transformative Learning	No further message, idea, question or resources are given to encourage learners to extend their learning and transfer to other topics.	Provides a message, idea, question or/and additional resources to encourage learners to extend their learning but it is not clear how the students' new knowledge can transfer to other topics.	Provides a message, idea, question or/and additional resources to encourage learners to extend their learning and clearly relates how the students' new knowledge can transfer to other topics.	

Comments for **Conclusion**

Teacher Page	Unacceptable (1)	Acceptable (2)	Target (3)	Score
Standards	Common core curriculum standard(s) are not listed for the webquest or listed curriculum standard(s) are irrelevant, too many.	Common core curriculum standard(s) are listed in words, not only numbers, and they are relevant, but the link(s) back to the standards website is missing.	Common core curriculum standard(s) are listed in words, not only numbers, and they are relevant and the link(s) back to the standards website is given.	
Credits	Credits / references are not given for any of the content used from external resources (graphics, clipart, backgrounds, music, videos etc.).	Credits / references are not given for all of the content used from external resources (graphics, clipart, backgrounds, music, videos etc.).	Credits / references are given for all of the content used from external resources (graphics, clipart, backgrounds, music, videos etc.).	

Comments for **Teacher Page**

Overall Design	Unacceptable (1)	Acceptable (2)	Target (3)	Score
Use of Graphics	Inappropriate selection and use of graphic elements (irrelevant, distracting and/or overuse of images.). The graphics are not supportive of the webquest and do not give students information or perspectives not otherwise available.	Appropriate selection and use of graphic elements (relevant, not distracting and/or not overused) but the graphics are not supportive of the webquest and do not give students information or perspectives not otherwise available.	Appropriate selection and use of graphic elements (relevant, not distracting and/or not overused). The graphics are supportive of the webquest and give students information or perspectives not otherwise available.	
Spelling and Grammar	There are serious spelling and/or grammar errors in this webquest that distract from the meaning and don't model appropriate language.	There are some minor spelling or grammar errors but they are very limited and do not distract from the meaning.	The spelling and grammar has been checked carefully and there are no errors.	
Consistent Look and Feel	The webquest does not have a consistent look and feel (fonts, colors etc.) and does not provide consistent working navigation from page to page.	The webquest has somewhat consistent look and feel (fonts, colors etc.) and provides somewhat consistent working navigation from page to page.	The webquest has a consistent look and feel (fonts, colors etc.) and provides consistent working navigation from page to page.	
Working Links and Use of Tables	There are serious number of broken links, misplaced or missing images, badly sized tables etc. that makes webquest ineffective to navigate.	There are some broken links, misplaced or missing images, badly sized tables but does not make webquest ineffective to navigate.	No mechanical problems noted.	

Comments for **Overall Design**

Overall Comments

Scores Received

Points:_____ || Percentage:_____

Adapted from Zunal.com

Appendix B

Student's Questionnaire

Name_____ Date_____

Yr/Section_____

DIRECTIONS: Below are items regarding the WebQuest activity on conic sections you have just used in your class Evaluate the effectiveness of the use of the WebQuest based on your personal perception. Please answer honestly. Use the scale below:

	DESCRIPTION
4	• You strongly agree with the statement.
3	• You agree with the statement.
2	• You disagree with the statement.
1	• You strongly disagree with the statement.

Statements	4	3	2	1
7. I learned how to graph conic sections and manipulate their equations during the WebQuest.				
8. The WebQuest was very clear to me.				
9. I enjoyed using the WebQuest.				
10. The WebQuest used in class was effective in teaching me the lesson on conics.				
11. The format of the WebQuest engaged me in the task.				
12. All in all, I learned a lot through the use of the WebQuest.				

Comments:

_____

_____

_____

Appendix C

Frequency Distribution and Average Rating of the Evaluators' Responses.

Frequency Distribution and average Rating of the Evaluators' Responses

Directions: Check the items that apply to the WebQuest evaluated. Use the 3-point scale below:

1- Unacceptable, 2- Acceptable, 3- Target

	Evaluator 1	Evaluator 2	Evaluator 3	Average
Title Page				
• Title	3	2	3	2.67
• Description	3	3	3	3.00
• Grade Level	3	2	3	2.67
• Keywords	3	3	3	3.00
Introduction				
• Motivational Effectiveness of Introduction	2	2	3	2.33
Task				
• Clarity of Task	3	3	3	3.00
• Cognitive Level of Task	3	3	3	3.00
• Cognitive Level of Learners	3	3	3	3.00
Process				
• Clarity of Process	3	2	2	2.33
• Scaffolding of Process	3	3	2	2.67
• Collaboration	2	2	2	2.00
Resources				
• Relevance and Quality of Resources	2	2	3	2.33
• Quality of Resources	2	3	3	2.67
• Organization of Resources	2	3	3	2.67

Evaluation				
• Clarity of Evaluation	3	2	3	2.67
• Relevancy of Evaluation	3	3	3	3.00
Conclusion				
• Summary	2	1	3	2.00
• Further Study and Transformative Learning	2	2	3	2.33
Teacher Page				
• Standards	3	2	3	2.67
• Credits	2	2	3	2.33
Overall Design				
• Use of Graphics	3	3	3	3.00
• Spelling and Grammar	3	3	3	3.00
• Consistent Look and Feel	3	3	3	3.00
• Working Links and Use of Tables	3	2	3	2.67

Overall Mean: 2.67

Appendix D

Hardcopy of the Developed WebQuest

Conics Shirt Design Art

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Welcome

Welcome: Conics Shirt Design Art
Description: In this WebQuest, students will use math to create their own graphic t-shirt designs. This WebQuest will introduced students to conic sections graphically and will help them develop an understanding of circles, parabolas, ellipses and hyperbolas.
Grade Level: 9-12
Curriculum: Math
Keywords: conic, circle, parabola, ellipse, hyperbola
Author(s): Roy Carlo Advincula

Conics Shirt Design Art

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Introduction

You may not be aware before but conics are everywhere. This time, you will have the chance to use them and have fun with them. Your group will work like graphic artists and create your very own shirt design using circles, parabolas, ellipses, and hyperbolas. Will your group be up to the task and come up with an interesting design?

The Public URL for this WebQuest:
http://zunal.com/webquest.php?w=253112

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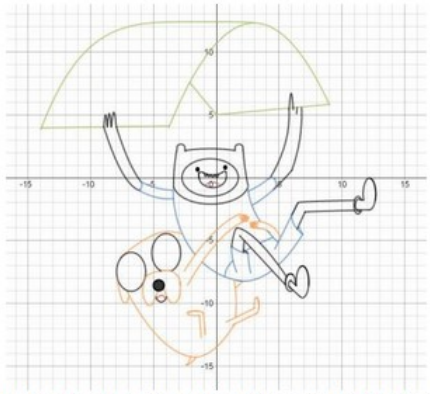
Task



Your job in this WebQuest is to make a picture which incorporates conic sections. You will learn about conic sections through research and gain an understanding on how you can use them to produce your group's design. You will use the Desmos calculator as a tool to graph equations, forming them into a picture of your choosing. This is your chance to combine your keen mathematical skills with your creative side. This project has very few restrictions, but here are the guidelines you need to follow for picture creation and submission:

- Use the Desmos online calculator to create your shirt design. This will allow you to save your work as you go along, then share your final product as a link. Consider restricting domains and/or ranges of your equations.
- Your group's final design must incorporate the 4 conic sections. You may also use lines and graphs of other functions that you have learned (or not learned yet!).

Desmos Online Graphing Calculator
Go to this page to familiarize yourself with the graphing calculator you will use for the task.

Hello Kitty Conics Desmos

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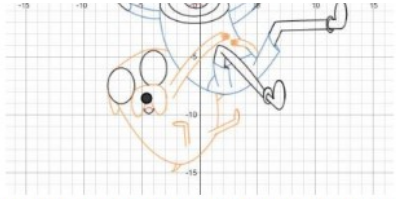
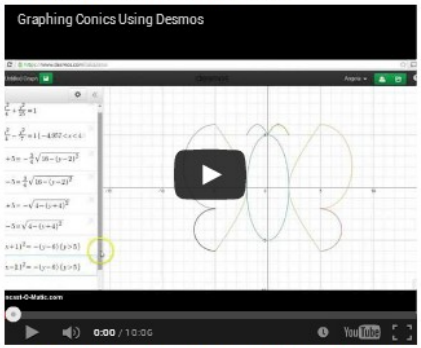


Your job in this WebQuest is to make a picture which incorporates conic sections. You will learn about conic sections through research and gain an understanding on how you can use them to produce your group's design. You will use the Desmos calculator as a tool to graph equations, forming them into a picture of your choice. This is your chance to combine your keen mathematical skills with your creative side. This project has very few restrictions, but here are the guidelines you need to follow for picture creation and submission:

- Use the Desmos online calculator to create your shirt design. This will allow you to save your work as you go along, then share your final product as a link. Consider restricting domains and/or ranges of your equations.
- Your group's final design must incorporate the 4 conic sections. You may also use lines and graphs of other functions that you have learned (or not learned yet!).

Desmos Online Graphing Calculator
Go to this page to familiarize yourself with the graphing calculator you will use for the task.

Graphing Conics Using Desmos



Watch the video to have an idea on how conic sections were used to create a design.

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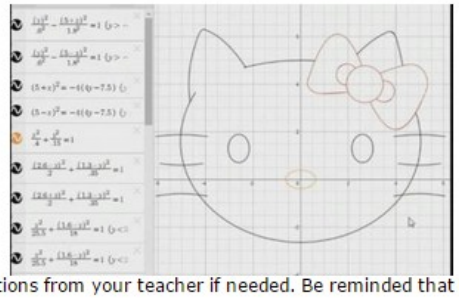
Process



Simply follow each step. Feel free to ask questions from your teacher if needed. Be reminded that this is a group activity, make sure everyone in the group is involved in the task.

Step 1: Research

Picture Editing

- When your picture is complete on Desmos. Use "PrintScreen" to move it to a photo editor, like Paint, which you can then use to color it.

Step 3: Graphic Design

Draw the design your group will use on a graphing paper. Include all four conic sections in your design.

Step 4: Draft to Graph Conversion

Label each line and curve in the drawing with a corresponding equation. Consider the restriction for the values of x or y for each equation if needed.

Step 5: Desmos Input

Learn the basics of using the Desmos graphing calculator with Desmos Quick Start Guide. Encode the equations in Desmos. Adjust the equations if needed to match the design in your group's draft.

Step 6: Picture Editing

Use "Printscreen" and paste your finish work in Desmos on a photo editor. You may only add colors to your design BUT not new elements such as lines and curves.

Step 7: Finish Product

Prepare the following for submission:

1. Desmos graph

- Print the design you created using Desmos on a short bond paper. Label each graph on the design by number .

2. List of Equations

- Prepare all the equations you used for the design. Include the restrictions you used. Label each equation with the graph number it corresponds to.

3. Completed Picture

- Print the edited picture on a short bond paper.

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Evaluation

Your conic design will be graded using the rubric below. You will be graded as a group. You will also submit individually a completed self-reflection form. The link for the form is provided below.

Evaluation Rubric

	Unsatisfactory	Satisfactory	Very Good	Exemplary	Score
Worked Together as a Group	No roles were assigned and only some members contributed in the completion of the design.	No roles were assigned, but all members were able to contribute something to the design.	One or two members of the group were not assigned clear roles for the activity.	Individual roles were assigned; each member of the group was able to contribute to the production of the design.	__ / 4
Intricacy of Design	The design only contains 10 or less graphs of conic sections.	The design contains 11 - 20 graphs of conic sections.	The design contains 21 - 30 graphs of conic sections.	The design contains more than 30 graphs of conic sections.	__ / 4
Completeness of Design	The design only contain one type of conic shapes.	The design is missing two types of conic shapes.	The design is missing one type of conic shapes.	The design has all required conic shapes, equations match with the graph.	__ / 4

Total Score: ____ / 12

Self Reflection form

The Public URL for this WebQuest:
http://zunal.com/webquest.php?w=253112

Conics Shirt Design Art

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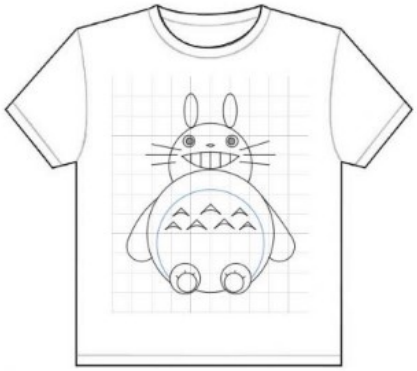
Conclusion



Congratulations!

Your group has successfully created a graphic design using mathematics. Well, what do you think of conic sections? Are you now comfortable with the graphs of circles, ellipses, hyperbolas and parabolas?

At this point, you should be able to:

- identify and differentiate circles, ellipses, hyperbolas, and parabolas;
- recognize the equation and the implication of the values in the equations of a conic section;
- manipulate the equation of a conic section to adjust its graph.

Now that you've learned the basics in graphing conic sections and familiar with the standard form of their equations, you are now ready to deal with more challenging lessons about conic sections.

Why don't you start with this tutorial on the general form of the equation of a conic section? Simply click this link.

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Teacher Page

This WebQuest will help students grasp the basics of conic sections and their graphs. This WebQuest will take 6 to 7 meetings to finish.

Standards

Conic sections are not really included in the DepEd K-12 Math Curriculum (except for circles).

Credits

Images were taken from the following webpages:

http://cse.ssl.berkeley.edu/bmendez/ay10/2000/notes/lec6.html
http://www.bcstatic.com/25-free-shirts-templates/
http://www.zazzle.com/
https://www.desmos.com/
http://www.sunilhazari.com/education/documents/sei.htm

ROY CARLO LOPEZ ADVINCULA

PERSONAL INFORMATION

Date of Birth	September 1, 1986
Place of Birth	Caloocan City
Civil Status	Single

EDUCATION

2008 – Present	Master of Arts in Teaching Mathematics *39 units*	PHILIPPINE NORMAL UNIVERSITY Taft Avenue, Manila
2003-2007	Bachelor of Science in Mathematics for Teachers *Cum laude*	PHILIPPINE NORMAL UNIVERSITY Taft Avenue, Manila
1999-2003	High School *Salutatorian*	CATHOLIC SCHOOL OF PACITA Biñan, Laguna
1993-1999	Elementary *2nd Honorable Mention*	COLEGIO SAN AGUSTIN Biñan, Laguna

SCHOLARSHIPS

2003 - 2006	Top 20 PNUAT Scholarship	PHILIPPINE NORMAL UNIVERSITY
2003 - 2006	Entrance Scholarship	PHILIPPINE NORMAL UNIVERSITY

WORK EXPERIENCE

May 2007 – Present	Teacher	SAN BEDA COLLEGE ALABANG *Taught Elementary Algebra, Intermediate Algebra, Geometry, Trigonometry, Advanced Algebra and Analytic Geometry.*

BOOKS AUTHORED

2013	Co-Author	Global Mathematics 8 The Library Publishing House, Inc.
2014	Co-Author	Conceptual Math and Beyond 5

(K to 12 Edition)
Brilliant Creations Publishing, Inc.