**Roanoke Valley Governor’s School for Science and Technology  
Mentorship  
Competency List**

Mentorship provides students with the opportunity to carry out independent research projects in laboratories or worksites under the guidance of professionals from the local scientific and technological community. Each student is matched with a mentor based on mutual interests. Contributions from the scientific and technological community provide resources for student project work and to the school-based research lab program.

**COURSE COMPETENCIES**

**COMPETENCY I**

**Design a plan to implement a project which includes background research, project proposal, introduction and cover letters, and mentor contact.**

*Enabling Objectives:*

1. Initiate contact with mentor to develop a viable research investigation.

2. Compose an introductory letter and cover letter to preface the development of a mentorship project.

3. Construct a project proposal with a science, mathematics or technology theme.

4. Investigate the project topic by conducting background research.

5. Construct a resume for examination and acceptance by the mentor before beginning the mentorship project.

**COMPETENCY II**

**Engage in appropriate behavior, follow standards, and complete responsibilities while at the mentorship site.**

*Enabling Objectives:*

1. Report on time to a designated area.
2. Contact mentor and RVGS in the event of illness or emergency.
3. Remain with the assigned mentor at all times while at the mentorship site.
4. Dress in the appropriate manner for the mentorship, and be neatly groomed.
5. Perform only activities outlined and specified by the mentor.

**COMPETENCY III**

**Maintain accurate records of activities, data, and compilation of work in a logbook.**

*Enabling Objectives:*

1. Maintain a journal portion of the logbook for detailed daily activities and subjective comments.
2. Maintain a research portion of the logbook to include dates and times of entries, observations, purposes, hypotheses, experimental procedures, professional contact, background research, data, results, conclusions, and discussion.

**COMPETENCY IV**

**Develop effective time management strategies.**

*Enabling Objectives:*

1. Utilize the RVGS daily planner or another organization system for tracking assignments and deadlines.
2. Produce individual segments of the research paper at required intervals, as an exercise in the writing process.
3. Implement research and activities as designated by the mentor in the time frame requested.
4. Be flexible with changes in schedules and research situations.
5. Respect and appreciate the time, effort, and consideration given by mentor.

**COMPETENCY V**

**Select and utilize appropriate information resources for specific research situations.**

*Enabling Objectives:*

1. Utilize the internet to obtain relevant current related literature and background information to guide the project.
2. Use professionals in industry or academia as resources for correspondence regarding research project information.
3. Prepare a media presentation to synthesize mentorship experiences.
4. Prepare a presentation of a current event related to research topic.

**COMPETENCY VI**

**Design and present a display at the RVGS Project Forum.**

*Enabling Objectives:*

1. Design an informative and attractive display for oral presentation.
2. Discuss in a professional manner the aspects of the project or study area, to include introductory information, purpose, hypothesis, methods, data, results, conclusions, discussions, and extensions or applications of the project or study area with professionals in the particular field of study, and in the classroom.
3. Incorporate suggestions, alternatives, and extensions from professionals during the oral presentation into the journal portion of the logbook.

**COMPETENCY VII**

**Prepare for unique demands and activities required of a high school senior preparing for college.**

*Enabling Objectives:*

1. Write and critique college essays.
2. Prepare and participate in mock college and job interviewing.
3. Write sample cover letters and resumes to colleges and potential employment agencies.
4. Attend a professional meeting or presentation; present report to Mentorship class.

**RESEARCH PAPER COMPETENCIES**

COMPETENCY I

**Conduct scientific investigations using accepted principles of experimental design or engineering goal and analysis.**

*Enabling Objectives:*

* 1. Apply the definition to identify the major concepts of experimental design or engineering goal within the scenario of an experiment including: hypothesis, dependent variable independent variable, constants, control, repeated trials or problem identification, creating alternate solutions, prototyping, testing, and redesigning.
  2. Apply concepts learned in science and math classes to analyze experiments with respect to the major concepts of experimental or engineering design, design strengths and weaknesses, and develop improved designs.
  3. Write a clear and precise set of procedures.
  4. Apply information learned in science and math courses and use technology available at the school to construct appropriate data tables and graphs for various types of scientific data.
  5. Describe the relationship between variables depicted on a graph.
  6. Develop and discuss ethical guidelines for research projects.

COMPETENCY II

**Gather and analyze relevant background information.**

*Enabling Objectives:*

1. Identify relevant library, database, and web resources for specific research problems.
2. Effectively use relevant library, database, and web resources for research and information.
   1. Use search engines to find information on various topics.
   2. Explain strengths and weaknesses of various search engines.
   3. Demonstrate proficiency using advanced search engines.
   4. Properly use and cite information taken from a variety of sources.
   5. Recognize and distinguish between different types of websites.
3. Use professionals in industry or academia as resource people for research project information as necessary and document these contacts.
4. Obtain the most relevant articles and books found in library and internet searches.
5. Analyze articles and books for information relevant to a specific research problem and take notes from them, using proper documentation.

COMPETENCY III

**Complete the steps necessary to design, implement, and analyze a complex experiment or engineering goal.**

*Enabling Objectives:*

1. Design a complex experiment which includes repeated measures over time or subjects, one or more independent variables, and correlation of variables.
2. Successfully meet the established time lines for the performance objectives.
3. Maintain a current, organized, and accurate laboratory logbook.
4. Construct appropriate data tables and graphs for data derived from your experiment.
5. Apply concepts of inferential and descriptive statistics to support conclusions from the experiment.
6. Participate in the RVGS Project Forum and, if appropriate, in the district, regional, state, and international science fairs, and the annual VJAS meeting.

**RESEARCH PRESENTATION COMPETENCIES**

COMPETENCY IV

**Create a project display board or poster to depict the work done on the project for use at Project Forum.**

*Enabling Objectives:*

* 1. All content should be easily read on the board and free of spelling and grammatical errors.
  2. All components of the board should be clearly labeled with appropriate headings (Introduction, Purpose, etc.).
  3. All graphs and photographs should be clearly labeled with appropriate annotations and citations when necessary.
  4. The name of the student should **not** appear anywhere on the display.
  5. Size specifications for project display board (ISEF regulations) are followed.

COMPETENCY V

**Construct a formal research paper following the format approved by the Virginia Junior Academy of Science.**

*Enabling Objectives:*

1. Create an integrated document.
2. Use information obtained from research to write an introduction and bibliography for the paper.
3. Write a methods and materials section that outlines the procedures followed in the project.
4. Write a results section that includes appropriate tables, graphs, statistics and diagrams. Include a narrative of the results obtained.
5. Analyze the results obtained in the discussion and conclusions section. Relate the project’s work to already published work.
6. Submit the research paper, in VJAS format, to the elective teacher.

COMPETENCY VI

**Create a presentation of the research project and present the research to classmates or at a scientific meeting.**

*Enabling Objectives:*

* 1. Incorporate text and graphics into a presentation.
  2. Add appropriate transitions between elements in a slide and transitions between slides.
  3. Effectively use color for backgrounds and text to add visual value.
  4. Organize key points so that the presentation flows logically and is easy to follow.
  5. Use proper enunciation, pronunciation, pace, and volume in communicating the research to one’s peers.

1. **Assignment List and Deadline Windows**

|  |  |
| --- | --- |
| **Item** | **Completed By** |
| Summer Assignments | First Week of School |
| Introductory Research Activities | End of September |
| On-the-Job Presentation | End of September |
| Problem Statement | Middle of October |
| Introduction (Draft) | End of October |
| Literature Cited (Draft) | End of October |
| Current Events Presentation | End of November |
| Materials Needed | End of November |
| ISEF Forms 1, 1A, 1B, & Supplemental | End of First Semester |
| Research Plan | End of First Semester |
| Introduction (Final) | End of First Semester |
| Literature Cited (Final) | End of First Semester |
| Summary of Professional Meeting or Presentation | End of First Semester |
| Introduction (Display Board) | First Week of Intersession |
| Literature Cited (Display Board) | First Week of Intersession |
| Materials (Display Board) | Second Week of Intersession |
| Procedure (Display Board) | Third Week of Intersession |
| Project Title | Third Week of Intersession |
| Photos (Display Board) | Third Week of Intersession |
| Results (Display Board) | Fourth Week of Intersession |
| Lab Notebook (Final) | Fourth Week of Intersession |
| Conclusions (Display Board) | Fourth Week of Intersession |
| Future Considerations (Display Board) | Fourth Week of Intersession |
| Abstract | Fourth Week of Intersession |
| Abstract Form | Fourth Week of Intersession |
| Display Board Completed | Fourth Week of Intersession |
| VJAS Paper (Draft) | Second Week of February |
| VJAS Paper (Final) | Third Week of February |
| VJAS PowerPoint (Draft) | Second Week of March |
| VJAS PowerPoint (Final) | End of March |
| VJAS Practice and Revisions | End of April |

B. **Strategies for Improvement of Competitiveness at State Competitions**

* 1. Faculty expectations
     1. Communicate with students and parents of first and second place projects that they are expected to compete beyond project forum, where possible.
     2. Increase the number of continuation projects by 10% school-wide.
     3. Provide students with the opportunity to reflect on the mastery of their own research through classroom lab meetings.
     4. Develop a cohort of expert contacts in the community and document their involvement in student research.
     5. Review proposals for student research and make changes as needed to improve rigor.
     6. Schedule meetings for faculty to collaborate on student projects; use professional development day for faculty collaboration on student research.
     7. Establish appropriate timelines and provide opportunities for review of project display boards and presentations in order to ensure high quality.
  2. Student expectations
     1. Placement at Project Forum implies strong expectation to continue to at least one regional, or state, science competition.
     2. Presentation
        1. Must be practiced before a committee to enhance confidence and credibility.
        2. PowerPoint modifications: few words; slides are not read
        3. Statistics: must be checked and verified for validity
     3. Revisions to presentation/paper done as needed.
     4. Copies of paper, presentation, forms, and an electronic copy on a flash drive are the responsibility of the student.