Research Opportunities for Science Educators (ROSE)

Organizers

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Mission

The ROSE Program energizes and enhances science teaching in New Mexico by leveraging the research resources of the University of New Mexico (UNM) and the educational resources of the State of New Mexico Public Education Department (PED). The central activity is an authentic research experience in which teachers (ROSE Scholars) join ongoing projects for first-hand participation in discovery-based research. The embedded Scholars see firsthand "how science is done" and the interdependence of various disciplines and subfields while working with faculty and student researchers. Scholars are selected based on the underrepresented minority (URM) and economically challenged student populations of their schools and their own scientific interests and background. They return to their classrooms bringing new ideas, tools and enthusiasm to share with students. From this core experience, ROSE will assist Scholars statewide in building a community to share experiences and educational resources.

ROSE will

-improve the quality of science education in NM schools by refreshing knowledge and inspiring confidence in middle and high school teachers

-forge connections between UNM and schools by acquainting teachers with university resources and educating UNM faculty on issues facing the schools

-incorporate K-12 and higher education faculty into a collaborating community of STEM educators statewide.

ROSE Annual Report for 2025

Executive Summary

The ROSE program had a small but successful summer research session in 2025, with 20 Scholars and 16 faculty mentors participating. Scholar comments from anonymous surveys during and after the session were overwhelmingly positive about their experience and its effect on their teaching. One Scholar wrote that "It was an experience that actually changed my mind about teaching, everyone was so passionate about science and research. I was going to quit after this year, but realized last summer this is what I love and am having the best year in my science classes." The 2025 Scholar cohort teaches >2,000 students each year, and the program total (Scholars participating over 5 years) now teach >5,000 students each year. Another Scholar wrote that "My research poster is hanging in my classroom, and I use it to remind students that we are all lifelong learners, and that true growth comes when we feel outside of our comfort zone."

Because PED is no longer supporting Scholars with stipend payments, Scholar recruiting efforts and acceptances decreased relative to summer 2024. The program accepted 20 of 48 applicants (~40%), mostly from schools with high enrollments of Yazzie/Martinez students (Indigenous, Hispanic, English Language Learners) and/or economically challenged students. Geographic diversity was also a selection criterion, and 2/3 of the Scholars came from districts outside the Albuquerque metropolitan area- from Shiprock to Lovington. Roughly half of the cohort was new to ROSE, while the other half was returning for a second or third summer.

As usual, Scholars' summer research projects spanned a range of disciplines (Chemistry, Biology, Engineering, Medicine, Toxicology) and approaches (computational, lab experiments, field work). One Scholar wrote that "The ROSE program really influenced my teaching this semester. Being out in the field collecting litterfall, observing soil, and identifying plants and animals gave me a new appreciation for hands-on science. I felt more connected to the content myself, and that inspired me to bring the same energy into my Biology classroom." Additional 'cohort activities' included tours of research labs, a visit to the Museum of Southwestern Biology, a software tutorial on molecular visualization, two discussions on how to integrate research into classroom activities and regular social events..

At the suggestion of Scholars, a Facebook group was created to promote communication among the teachers and between the teachers and UNM. So far, this has been more useful for UNM-Scholar communication than for 'community-building' among the Scholars.

The loss of PED funding for Scholar stipends, which had been variable but significant, prevent the program from expanding and also led to more reliance on funding from NSF and NIH research grants; at the same time, federal policy changes have decreased or eliminated some funding opportunities for programs like ROSE. Going forward, obtaining stable funding at an appropriate level remains a priority for the ROSE program.

I. History

ROSE began as a pilot project in 2021 to provide statewide outreach to public schools and their science classes by embedding teachers into authentic research projects at UNM. With support from NM PED, eight science teachers from across New Mexico came to join ongoing research projects in UNM's department of Chemistry and Chemical Biology (CCB) for 4 weeks in summer. The number of applicants (40) and teacher responses (overwhelmingly positive) encouraged UNM and PED to continue and expand the program.

In 2022, the program secured increased funding from the Math and Science Bureau of PED and from the HED RPSP program (categorical funds for Teacher Pipeline) which permitted an expansion to 20 teachers (Scholars), most of whom were housed in UNM dorms for the 5-week summer session. A quantitative survey approach was used for program assessment, and both Scholars and faculty mentors had very positive responses.

The 2023 research session hosted 22 Scholars for 4 weeks, and the mentor group included faculty from 3 A&S departments (Chemistry, Biology, Earth Sciences), Chemical and Biological Engineering and Pharmacy. In the October follow-up survey, Scholars responded that ROSE had changed the way they teach, reporting increased self-efficacy regarding teaching science concepts (67%) and practices (89%). Following the summer session, ROSE proposed and was approved to implement a more formal organizational structure reporting to the OVPR.

The 2024 research session hosted 28 Scholars for 5 weeks, and the mentor group included faculty from 3 A&S departments (Chemistry, Biology, Earth Sciences), 3 SoE departments (Chemical and Biological, Mechanical and Civil Engineering) and the colleges of Pharmacy and Education and Human Sciences. Scholars teach over 100 students a year, on average (3,679 total students). One Scholar wrote "Doing research in a wet lab changed the way I include science practices in my class…no more graphic worksheets trying to mimic real science. and then to put into posters and presenting them is amazing and makes me more confident. I can't wait to host and make the STEM nights for families in school this year!"

The program continues to evolve in response to feedback from Scholars and other stakeholders, hoping to significantly benefit the STEM education ecosystem by improving the skills, confidence and enthusiasm of science teachers across New Mexico.

II. Publicity and Scholar Recruitment

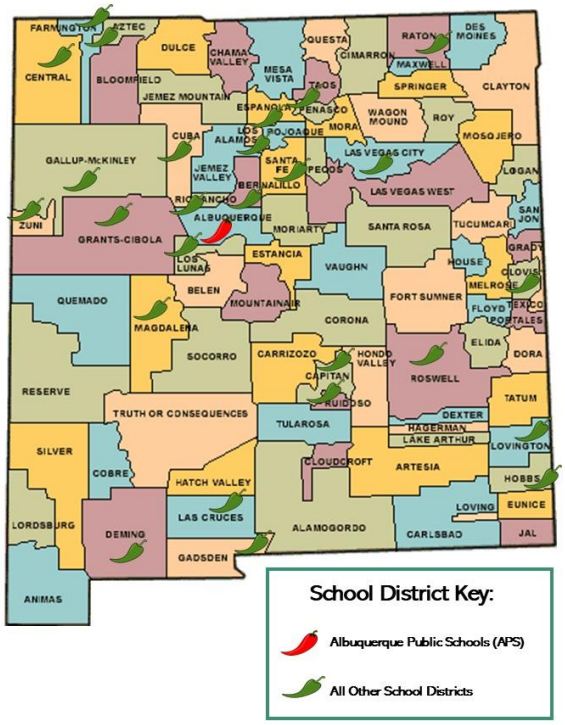
The website (https://UNMROSE.unm.edu) continues to be the principal outward 'face' of the ROSE program through the recruitment period and the summer research session. Photos and PI research descriptions were updated as new items became available, and lists of Scholars were posted for each summer session. News stories ran on the departmental website before the summer research session and on the UNM news site after the summer session.

Advertising for the 2025 session began in Fall 2024 and included a table display at the annual NMSTA conference (October 2024 at UNM HSC) as well as online mechanisms. All NM superintendents were notified by email in October that due to loss of funding from PED, ROSE was soliciting stipend support from districts; only APS responded. A preliminary advertisement (informational, but no online application available) ran in PED's STEM Connect newsletter in November 2024. The first advertisements containing the online application link ran on the NMSTA website in January and early February 2025 and in STEM Connect during the same period (text for all ads can be found in Appendix A). Also in late January, recruiting emails were sent to the 2021 and 2022 Scholars and to superintendents of all NM school districts (including charters). Both the NMSTA and STEM Connect newsletter are 'opt-in' channels which teachers must sign up for; we have not found a comprehensive email list for science teachers in NM.

III. Scholar Selection and Distribution

The ROSE online application for summer 2025 went 'live' on January 15 with a best consideration date of March 1. The first round of application acceptances had a target date of March 8 to be followed by Scholar acceptances until the end of March (Timeline in Appendix B). The application used Qualtrics and was managed by the ROSE program coordinator.

We received 48 completed applications by the best consideration date (Appendix C). The organizing committee evaluated applicants based upon student demographics at their schools, geographic distribution, professional preparation, the ability of PIs to accommodate returning Scholars and short-answer questions about motivations. Demographic data obtained from the NM PED STARS site (https://webnew.ped.state.nm.us/bureaus/information-technology/stars/) included percentages of Hispanic and Native American student populations, English language learners and economically challenged students. Professional preparation data included self-reported academic degrees, years taught and subjects currently/recently taught.



Geographic distribution: The 2025 Scholar cohort of 20 teachers (Appendix D) represented schools from across the state, including 12 returning Scholars from Shiprock, Zuni, Las Vegas, Santa Fe, Gadsden, Gallup, Santo Domingo, Lovington, and Valencia county. The 8 new Scholars included 3 from Albuquerque and others from Santa Rosa, Grants, Santa Fe and the Dine' reservation. The majority of Scholars teach in the northern half of the state, with only two from schools in the southern NM.

Student demographics: The 2025 Scholars typically teach at schools with high percentages of Hispanic, Indigenous and/or economically challenged students, all groups cited in the Yazzie-Martinez decision of 2018. Five of the Scholars (25%) came from schools with ≥90% Indigenous students, while 7 (35%) came from schools with ≥70% Indigenous. Nine of the schools (45%) have over 70% Hispanic enrollment. Nine Scholars (45%) taught at schools with ≥ 50% economically challenged students, and 13 (65%) taught at schools with >20% English language learners.

IV. Summer Research and Cohort Activities

The 20 Scholars of the 2025 cohort were matched with 16 faculty mentors from across campus (Appendix E). This represents a ~30% decrease in the number of mentors versus 2024, but includes the new participation of faculty from the Cancer Research Center (Gillette, Kim). Twelve Scholars were mentored by A&S faculty (6 in CCB, 5 in Biology, 1 in E&PS), four were mentored in SoE (2 in CBE, 1 in MechE and 1 in CCEE) and four at HSC (2 in CoP and 2 in the Cancer Research Center). Nine Scholars were mentored by six women faculty (four worked on the Sevilleta LTER under the overall direction of Prof. Rudgers).

The summer research session ran for 5 weeks from Monday June 9 to Friday July 11, similar to 2024. Out-of-town Scholars moved into the UNM housing (Redondo Village) on the

UNM campus on Sunday June 8. The first day (June 9) included program orientation, safety training and a welcome reception at the Student Union Draft and Table; new Scholars also met their mentors in person. Beginning June 10, Scholars joined ongoing research projects which were their principal occupation for the duration of the session. Research projects ranged from the computational sciences (molecular modeling, evolutionary theory) to molecular synthesis and analysis, to organismal and cell biology and ecology. Specific projects and Scholar/mentor pairings are given in Appendix E.

To encourage interactions among the Scholars and to broaden their exposure to UNM faculty and activities, Scholars were asked to attend a series of activities. These cohort activities included weekly coffee breaks (Tuesdays) and lunches (Fridays) to promote social interactions and informal exchanges of knowledge. An evening reception at the Explora Museum in Old Town ABQ was organized with fellows in the TODOS program (Noyes Scholars, science teachers from across NM). A more formal activity was scheduled each Friday afternoon:

a) two small-group sessions on 'Taking it Back' to the classroom, in which Scholars were asked to discuss how research principles can be used to improve their students' classroom experience.

b) an interactive tutorial on Chimera software molecular visualization software presented by graduate student Emily Hendrix from Prof. He's group.

c) an optional visit to the Museum of Southwestern Biology, a research museum with controlled public access, coinciding with a campus museum conference.

d) tours of faculty research labs and facilities to allow Scholars to see and hear about research outside of their own projects.

The summer session concluded Friday, July 11, with poster presentations by the Scholars on their summer research (poster titles in Appendix E). Posters were displayed in the atrium of the UNM Science and Math Learning Center; Scholars were encouraged to keep the posters afterwards for display in or near their classrooms. The session included a catered lunch and closing comments by the organizers The session was attended by ~60 UNM students and faculty in addition to the Scholars and also by Jan Williams from the Society of Women Engineers, Eric De Santo and Marisol Fraga from Albuquerque Public Schools and NM Senator Harold Pope.

V. Ongoing connections with Scholars

At the suggestion of Scholars during the 2025 summer session, a Facebook group was created to promote Scholar interactions during the year. The group "UNM ROSE Program" was created in July 2025 and can be found at https://www.facebook.com/groups/1277725693761458 The group is visible but private (only members can post) and has 23 members as of this writing. The group has been used for ROSE program announcements, publicizing STEM Education activities (for NMSTA, STEM Innovation Network NM, US Crystal Growing competition,

Society for Science grant, etc.) and to share Scholar accomplishments and activities. Scholar activities posted since July include:

Kathryn Samora- STEM IN mini-grant for Lincoln Middle School STEM club
Violet Hobbs- recommending Strawberry Extraction Activity
Geizi Dejka- received Outstanding Biology Teacher award
Vandhana Ramchandran- Extra Yard for Teachers award
Lamberto Geolin's students are New Mexico Finalists in the National STEM Festival

VI. Funding

ROSE received support from several different sources and mechanisms in 2025, including direct payments to ROSE, payments to Scholars, and in-kind organizational support. A major change from previous summers was the absence of PED funds to pay Scholar stipends, which substantially decreased the number who could be supported and prevented any program expansion. The HED requested a significant increase in the ROSE allocation from RPSP ($275K for FY26) which would have allowed continued program growth, but this was not approved in the 2025 legislative session.

UNM operating funds for the 2025 summer session were obtained from the HED RPSP program Teacher Pipeline Initiative (TPI) and the Office of the Vice President for Research (OVPR). For FY25 and FY26, $100K annually was allocated to ROSE from TPI. Because ROSE expenditures are centered on the June-July period, program expenses are more easily monitored on a CY (calendar year) basis. The OVPR contributed $50,000 as part of a 3-year, $150,000 internal grant.

The NSF CISTAR grant (lead UNM PI Abhaya Datye) paid the stipends for three Scholars who worked on CISTAR research. This grant also provided funding to bring the Scholars to UNM campus in October for a research meeting. NSF grants obtained by Sevilleta LTER director Prof. Jennifer Rudgers paid the stipends of 4 Scholars, and the UNM Cancer Research Center provided stipends for two Scholars to work with Prof. Kim and Prof. Gillette (Associate Director for Training and Education of the Comprehensive Cancer Center).

The Albuquerque Public School District (APS) paid the stipends for two Scholars teaching in that district (another Scholar from APS was paid using ROSE funds).

UNM expenditures for CY 2025 included $60K for Scholar stipends, $30K for on-campus housing and parking, $17K for graduate student "lab mentor" awards, $3K for staff coordinator salary, and $4K hospitality (space rental, catering). Miscellaneous expenses included lab safety equipment, poster printing, off-campus housing for CISTAR Scholars, conference participation and minor supplies. Total UNM expenditures from ROSE accounts in CY 2025 were ~$110K, with $63K remaining at the end of the calendar year (see Appendix F for December 2025 account statements for indices 885528 and 889561).

VII. Organization

ROSE continues to be run by an executive faculty committee and director assisted by a temporary, part-time staff program coordinator. The committee for 2025 consisted of Steve Cabaniss (CCB, A&S), Jeff Rack (CCB, A&S), Cari Hushman (EdPsy, CoEHS) and Eva Chi (CBE, SoE). Cabaniss and Rack were primarily responsible for planning, organization, and interactions with mentors, while with Hushman was primarily responsibility for program assessment and interactions with CoEHS and the STEM education community. Program coordinator Sarah Rascon handled correspondence, publicity, summer session logistics and the Facebook group.

With the upcoming retirement of Cabaniss planned for summer 2026, Rack became the sole program director starting in January 2026. The completion of Mark Walker's PREC grant leaves ROSE as the only program supported by Rascon, so her position will be converted to an 'on call' part-time.

VIII. Assessment Process and outcomes

Program assessment consisted of a series of Scholar surveys and PI surveys during and after the summer session (summary report is attached as Appendix G). Results were summarized as:

1. The ROSE fellows overwhelmingly had positive things to say about their experiences with ROSE and with their lab groups. They would come back again.
2. The PIs were overwhelmingly positive about hosting a ROSE scholar.
3. The majority of ROSE fellows reported little to moderate amounts of research experience prior to ROSE.
4. The average ROSE fellow has 14 years of experience teaching STEM, and has a degree in Education. Half of the fellows reported a LEVEL II teaching license. All had at least one endorsement in science or math.
5. This experience has impacted their ability to address the practices of science and engineering standards, the activities in their classroom, and the amount of open ended inquiry with their students.

Surveys were written, conducted and summarized by Carolyn Hushman, Associate Professor of Educational Psychology and Associate Dean for Research in the College of Education and Human Sciences. Scholars were asked to complete 3 surveys in Qualtrics- a welcome survey at the start of the summer session (20 completed), an endpoint survey in July (17 completed) and a follow-up survey in December (12 completed).

Scholar Impact

Classroom teaching impact of the ROSE experience is significant. On average, each scholar teaches 115 students in STEM classes (range 55-200), on average (5,279 total students

were taught by ROSE scholars from all cohorts). All the Scholars responding in December reported that they changed the way they teach due to their ROSE experience, including improved confidence in talking about research, new examples, new activities and the use of open-ended inquiry. Most teachers reported an increase in self-efficacy regarding teaching science concepts (64%) and practices (82%). In scholars' own words:

- "I work in a school where the Pueblo's culture is integrated in with the state teaching for NGSS. I am developing ways to mimic the research that I learned and passing that on to my students through the ways we think and talk about science in class."
- "I am now more confident in my science teaching, particularly in doing laboratory activities. We are planning to do the science fair project this second semester in the middle school since this was not continued after some years due to science teachers turn over. I am sure that this is another activity where we can concretely apply what we learned from the ROSE program."
- "The ROSE Program influenced my teaching by being more conscious in incorporating laboratory activities and by not being afraid of students experiencing experiments in the laboratory."
- "I am currently teaching Earth Science and I was able to utilize the activity I did during the ROSE Program on how to balance pH from an acid mine waste."
- "My research poster is hanging in my classroom, and I use it to remind students that we are all lifelong learners, and that true growth comes when we feel outside of our comfort zone. It is also referenced when we discuss the future careers and scientific breakthroughs that will be possible in the future, which makes the content more relevant to my students."
- "The first part of my semester fit in to my teaching using the New Mexico Standards which was "Assessing the Impact of Technology on Society", I integrated what I learned at UNM with the ROSE program and asking questions for instance, "what kinds of simulation do scientists and engineers use?" and "How social and environmental factors can change technology needs in different locations?"
- "Even at the start of the class, during the course orientation, I shared to my students my experience working and learning in one of UNM laboratories. I shared with them the work that the lab is doing on cancer research. There were more opportunities especially in the Medical Detectives class where we discuss about patients' vital signs, food outbreak, and how the brain works- I would share a bit about being a researcher. We also did the bacteria culture and antibiotic test, the sheep brain dissection, and toxin tests in the lab which my students greatly enjoyed. I processed the purchase of laboratory gowns for my students instead of using the plastic lab aprons so that when worn with their goggles and gloves, they are really like scientists or medical researchers."

- "The UNM-ROSE program deeply influenced my teaching approach by emphasizing culturally responsive pedagogy and inquiry-based learning. I became more intentional about connecting lessons to students' lived experiences, fostering a classroom environment where curiosity and critical thinking thrive. The hands-on activities and collaborative learning strategies I learned through the program helped me better engage diverse learners, especially in science. I've also focused on providing more opportunities for students to explore real-world problems and solutions, encouraging them to see science as not just academic, but as a tool for understanding and impacting their communities."

The ROSE experience also changed how teachers saw themselves. Survey responses showed 13% increase in agreement with the statement "I am part of the STEM workforce in New Mexico". Most (87%) teachers agreed or strongly agreed that ROSE left them more motivated to teach science. Scholars wrote:

- "I am more confident in guiding students during science experiments and asking more questions regarding deep thought for my students so they can ask 'why' or 'how' in a way they are able to determine the 'why' or 'how'."
- "The ROSE program really influenced my teaching this semester. Being out in the field collecting litterfall, observing soil, and identifying plants and animals gave me a new appreciation for hands-on science. I felt more connected to the content myself, and that inspired me to bring the same energy into my Biology classroom. Because of that experience, my students now use these techniques not only in their science fair projects but also in our regular classroom experiments. They collect their own samples, compare soil types, and observe local ecosystems with more confidence and curiosity. ROSE helped me see how powerful real-world data can be, and it made my lessons in ecology and climate science feel more authentic and engaging. Overall, it strengthened my teaching and helped my students see themselves as actual young scientists."
- "Looking back, I'm really grateful for the experience. One of the biggest successes was how easily I could bring what I learned into my lessons. My students were genuinely more engaged when we used local, hands-on activities. A challenge for me was balancing the time commitment with school responsibilities, but it was worth it. Overall, ROSE was a valuable and memorable experience that strengthened my teaching and changed how I engaged with my lessons."
- "My ROSE experience has greatly boosted my confidence in teaching scientific research skills to my students, particularly in the field of computational chemistry and biology. I was able to share with students the same research experience I gained last summer, guiding them through the concepts I learned under the mentorship of Dr. He and Ms. Emily. It was really the first time I saw what I did as part of the greater STEM workforce in NM"

- "After having several months to reflect, I can say that my ROSE experience was both transformative and deeply meaningful. It strengthened my teaching practice, expanded my scientific skills, and inspired me to bring more authentic research experiences to my students. We are all, students and me, having more fun in science this year."

Survey feedback on program logistics was helpful, and included information on recruiting, teacher motivation, and preparation for the summer. Teachers learn of the ROSE program from administrators, other teachers, and PED communications; they apply in order to improve their science knowledge and personally experience research. Most (78%) teachers felt they had enough information about logistics and stipends before the start of the summer program, but at the midpoint, 75% of teachers reported they were overwhelmed by the research and equipment in their lab (this decreased to 17% at the end of the session). Some teachers specifically requested more advance information housing and parking. Within the logistics, the state of the rooms in the dorms was mentioned/a concern in 59% of the responses.

Finally, ROSE is changing how Scholars interact with their students. Scholars wrote: wrote:

- "It was an experience that actually changed my mind about teaching, everyone was so passionate about science and research. I was going to quit after this year, but realized last summer this is what I love and am having the best year in my science classes."
- "The ROSE program was a wonderful reminder of what it feels like to be in a new environment and not know the content. It helped me remember patience and grace in a way that I hadn't been reminded of in a number of years. Students also are encouraged to work more independently in the lab with less direct instruction from me. Further, it was helpful for students to see that there are so many things they can do that they may not even be aware of, especially research possibilities."
- "Thank you so much for giving us the opportunity to see beyond our classroom and our school. You have allowed us to work directly with real scientists and researchers who are passionate in their fields. These are the same people we are preparing our students for int he future. In this way, we saw the future in them and we went back to our classrooms to ready our students in the best way that we can."
- "Before the ROSE program, I had no knowledge about modern research, since it has been well over a decade since I graduated college. Since attending the ROSE program, I have now gained not only firsthand experience, but the perspective to share this experience with my students in a way that has helped me develop those skills to teach students how to be more independent in the lab and how to collaborate with their peers in a constructive way."

PI Impact

For the PI Survey, 10 PIs completed the initial survey, seven completed the end of program survey. PIs were overwhelmingly looking forward to hosting a teacher in their lab and expressed being nervous about the short amount of time or not being helpful to the teacher. At the end of the experience, survey results showed an overwhelmingly positive experience for both

the lab group and the PI. Teachers contributed to the research by being good communicators and detailed oriented. It was suggested these surveys should go to the individuals in the groups directly working with the teachers and not the faculty PI. In the PI's words:

- "I did not know that there were dual language/ESL schools, actually I did not know much about the public schools. Our scholar really helped us understand how to be of better service and outreach in the school setting."
- "My graduate students LOVED working with the ROSE scholar. They learned a lot about how to translate their science into language a middle schooler can understand. It was great experience for us all."
- "The ROSE scholar collected preliminary data on new project, and we will be using it for the next year. They had a very strong contribution to my research group."
- "We were impressed with how much the teacher was committed to learning this science and apply it to their profession as a science teacher. It was something to see."
- "The scholar brought new energy into our group and really learned quickly. I was surprised by how much they wanted to learn about the research and the university. I had a great time walking them around campus and showing them different labs from my colleagues."
- "It helped us all talk about high school science. It made me think about the introduction courses freshmen take and the gap between high school and college. It will impact how I teach my lower division courses, at the very least."

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