Lesson Plan Title:\_Clocks of Time\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Length:\_\_6 classes\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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| **Course Name** | Art Education | **Grade Level** | High School |

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| **Enduring Understanding (s):**(Statements summarizing important idea(s) and core process(es) that are central to an art topic and have lasting value beyond the classroom. They synthesize what students should understand—not just know or do—as a result of studying a particular area of art. Moreover, they articulate what students should “revisit” over the course of their lifetimes in relationship to art.)  | **Prepared Graduate Competency (ies):**(List, in bullet form, which Prepared Graduate Level Competency [ies] will be addressed in this lesson as it [they] relate [s] to the enduring understanding [s].) |
| * Artists use new **technologies** to **discover** different ways of making art (**GLE HS.3.1.**)
* The **purpose** of an artwork can be achieved through **functionality** and **design** (**GLE HS.1.3**)
 | **Comprehend*** Recognize, articulate, and debate that the visual arts are a means for expression
* Make informed critical evaluations of visual and material culture, information, and technologies
* Analyze, interpret, and make meaning of art and design critically using oral and written discourse
* Explain, demonstrate, and interpret a range of purposes of art and design, recognizing that the making and study of art and design can be approached from a variety of viewpoints, intelligences, and perspectives

**Reflect*** Transfer the value of visual arts to lifelong learning and the human experience
* Explain, compare and justify that the visual arts are connected to other disciplines, the other art forms, social activities, mass media, and careers in art and non-art related arenas

**Create*** Develop and build appropriate mastery in art-making skills, using traditional and new technologies and an understanding of the characteristics and expressive features of art and design
* Create works of art that articulate more sophisticated ideas, feelings, emotions, and points of view about art and design through an expanded use of media and technologies
* Recognize, compare, and affirm that the making and study of art and design can be approached from a variety of viewpoints, intelligences, and perspectives

**Transfer*** Critique personal work and the work of others with informed criteria
* Recognize, articulate, and implement critical thinking in the visual arts by synthesizing, evaluating, and analyzing visual information
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| **Objectives/Outcomes/Learning Targets: Student will be able to... (Measurable)****(Aligned to: Bloom’s-Standards-GLEs/ and, when appropriate, Numeracy, Literacy and Technology. Should be written as: Objective. Bloom’s: \_\_\_\_\_ - Standard: \_\_\_\_\_ - GLE: \_\_\_\_\_. Numeracy, Literacy, and/or Technology)** |
| * Students will be able to create a clock face using the laser etcher that reflects a personal view of time. (Bloom’s: Create /Standard: Create/GLE: Demonstrate competency in traditional and new art media, and apply appropriate and available technology for the expression of ideas)
* Students will be able to create hands using the 3D printer that compliments the clock face. (Bloom’s: Create/Standard: Create/GLE: Make judgments from visual messages)
* Students will be able to use and describe at least one of the following technologies: Laser etcher, 3D printer, and Rhino program. (Bloom’s: Applying/Standard: Transfer /GLE: Communication through advanced visual methods is a necessary skill in everyday life)
* Students will be able to defend and demonstrate their symbolized meaning of ‘time’ in their finished clock using the appropriate art terminology. (Bloom’s: Understanding/Standard: Comprehend/GLE: Visual art has inherent characteristics and expressive features)
* Students will be able to use terms including NURBS, Mesh, render, raster image, and vector image using the appropriate software. (Bloom’s: Remembering/Standard: Reflect/GLE: Reflective strategies are used to understand the creative process)
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| **Pre-Assessment:** (Hint-Turn objectives into questions.)***(This will need to be done prior to teaching your lesson****.* Outline the method you will use to determine the skill/knowledge level of your students based on the concepts/objectives of the lesson. Be specific in describing what you would recognize as proficient skill/knowledge. |
| * Define what a laser etcher, 3D printer, and Rhino program is and how it works
* Explain use of terminology including form, shape, composition

To conduct this pre-assessment, I will ask students as a class to give me a thumbs up if they know what it is, and if so describe to me what they know about it. For the terms they can show me an example of how it is used.  |

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| **Accommodations and modifications:** (Explain specifically how you have addressed the needs of exceptional students at both end of the skill and cognitive scale. Describe the strategies you will use for students who are already proficient and need growth beyond what you have planned for the rest of the class, as well as modifications for students with physical and/or cognitive challenges. **Students must still meet the objectives**.) |
| If students need to be challenged:* Have the student relate his or her own idea of time related to other cultures possible ideas of time. Would they like the clock? Understand it’s meaning? Incorporate these thoughts into their design.
	+ How does our culture interpret time? How important is time to our culture?
	+ How important is time to another culture? Why?
* What are other ways you could have interpreted the assignment? Create an idea from the opposite perspective of your own about time.
* Adding paints or other media

If students need alternative access:* Have a student that understands the project help (not do)
* Less complex (ex: less numbers)
* Suggest students use text instead of creating an image
* Write down a list of phrases or words that support their idea of time (or class discussion)
	+ Create a web graphic organizer
* Have students work in a team of 2 to better understand the usage of tools etc
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| **Vocabulary and Literacy:****(**List terms specific to the topic that students will be introduced to in the lesson.) |
| Vocabulary:Shape, form, composition, raster image, vector image, NURBS, meshLiteracy:Students may include text on the face of their clock, students will be describing their process as well as explaining their clock meaning in relation to time, making notes in their sketchbook, Students will be defending their ideas and interpret artistic meaning, reading directions for complex machines and programs |

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| **Materials:** (Must be grade level appropriate. **List** everything you will need for this lesson, including art supplies and tools. (These are the materials students will use.) **List all materials in a bulleted format.)** |
| * Laser etcher
* sketchbooks
* pencils
* computer with appropriate programs (stl file maker, illustrator file maker)
* Material for clock face (wood)
* Material for 3D printer
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| Resources: (List all visual aids and reference material (books, slides, posters, etc.) Be specific; include title, artist, etc. Make reference to where the material can be found. (These are the resources used by the teacher to support/develop the lesson.) List all resources in a bulleted format.) |
| * How to get exact dimensions for numbers on clock in Corel Draw: <http://a-e-mag.com/question-answers/coreldraw-tools-for-creating-clock-face>
* Sample engraved clock, and assembly: <http://www.epiloglaser.com/sc_golf_clock.htm>
* Sample, zodiac clock: <http://www.etsy.com/uk/listing/170310463/wall-clock-zodiac-can-be-customized?ref=sr_gallery_10&ga_search_query=engraved+clock&ga_search_type=all&ga_facet=engraved+clock&ga_view_type=gallery>
* How to engrave video: <http://youtu.be/vuhvI5Na_zo>
* Engraving step by step tutorial (fab lab): <http://www.csufablab.org/wp-content/uploads/2013/09/Laser-step-by-step-tutorial.pdf>
* Fab Lab laser: <http://www.csufablab.org/laser-cutters/>
* digital tool box (how to use rhino tutorials): <http://digitaltoolbox.info/rhinoceros-basic/interface/>
* Illustrator tutorials: <http://digitaltoolbox.info/rhinoceros-basic/interface/>
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| **Preparation:** **(**What do you need to prepare for this experience? **List steps of preparation in a bulleted format.)** |
| * Each student needs to have preliminary sketches of their clock before starting,
	+ to purchase the correct amount of wood
	+ to purchase the correct amount of 3D printer material
* Sign up sheet for the laser etcher(s) so there is no heavy traffic at the machine
* Sign up sheet for the 3D printer(s) so there is no heavy traffic at the machine
* Make sure every student has a sketchbook
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| Safety: (Be specific about the safety procedures that need to be addressed with students. List all safety issue in a bulleted format.) |
| * Do not eat any of the materials
* Do not stare at the laser in the laser etcher because it could damage your eye (like the sun!)
* Do not open the laser while it is working
* Do not open the 3D printer while it is working
* Be careful of splinters
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| **Action to** **motivate/anticipatory set:** (Describe how you will begin the lesson to **stimulate student’s interest**. How will you pique their curiosity and make them interested and excited about the lesson? What inquiry questions will you pose? Be specific about what **you will say and do** to motivate students and get them thinking and ready to participate. Be aware of the varying range of learning styles/intelligences of your students. Some ideas might include: presenting a skit, telling a story, posing a series of questions, role-playing, etc.  |
| Students will be able to have a working usable clock (if desired)Using cool and new technologies such as the laser engraver and 3D printer |

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| **Ideation/Inquiry:** **(**Ideation is the creative process of generating, developing, and communicating new ideas, where an idea is understood as a basic element of thought that can be visual, concrete or abstract.List and describe inquiry questions *and* processes you will engage students in to help them develop ideas and plans for their artwork.) |
| * Why create an artwork representing time
* How can you represent time visually?
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| **Procedures:** (Align with instructional methodologies and approximate times for instruction.)Give a detailed account **(in bulleted form)** of how you will present the lesson logically and sequentially **(include approximate time for each activity).** Include motivation and ideation/inquiry where appropriate.) |
| **Day 1:** * What should be ready before class starts
	+ Make sure the machines are working
* Set expectations for the day
	+ Remind students to use their time effectively in class to get projects finished and looking polished and done
* Power Point presentation
	+ Ask: (to get their heads thinking and get excited about the next project, there are no right or wrong answers, this is just a discussion) (Be writing important ideas students come up with on the white board)
		- What does time mean to you?
		- Why create an artwork representing time?
		- How can you represent time visually?
	+ Encourage students to write these ideas on the board down if they are profound or interesting to them
	+ Time symbols: clocks, sun dials, hour glasses, and phases of the moon
		- Why do these represent time? and How?
		- What would a clock be without any numbers? What would it mean if a sun dial turned into a moon dial? Would an hour glass still function if we put something other than sand in it, and how would you interpret that?
	+ Introduce artists Salvador Dali
		- How does Dali represent time in this image? “The persistence of memory”
		- Why did he choose to show this image? His purpose?
	+ artist Xetobyte
		- How about how this artist represents time?
		- What is he trying to say with his image?
		- Could he have represented this in another way without using the obvious ‘clock’ symbol? How?
	+ Great wall of china and pyramids
		- How do these sites represent time?
		- What specifically about the structure itself might make you think about time? **Want students to be thinking about how process can also represent time.**
* Introduce the Project
	+ Ask:
		- Why is it important for artists to show ‘time’ in their work?
		- Why is this unit all about time? Why do I want you to care about it?
		- Why are YOU interested in time? What aspects interest you?
	+ Students will be creating a clock. But not just any clock, this clock is going to be their own work of art reflecting the student’s personal idea of time, and what it means to them personally.
	+ Materials: To create the face of the clock, will be using the laser engraver and 3D printer for the hands.
	+ Students will need to have at least 5 preliminary sketches before they can actually start using the machines.
	+ If there are some previous projects created show examples.
* Example demo
	+ Show an engraved artwork using both text and image for them to get a sense of how it will turn out
		- for the engraved images, you will notice that there is no gradation (same with what you get when using a media like graphite. This is because the laser engraver works best when using a vector image rather than a raster
			* **Vector – can be shrunk or expanded infinitely without the image losing quality**
			* **Raster – an image made up of different color pixels. Cannot be expanded without losing quality**
	+ 3D printer hands
		- Show that the 3D printer can only make small scale things, so it cannot be longer than a certain length, but if they need long clock hands then they can engrave them instead, but have them make at least one hand (just a shorter version) on the 3D printer to fulfil the objectives
	+ Illustrator or Corel Draw
		- will come in a second...
* ASK:
	+ So, what am I looking for in your thumbnail sketches?
		- Students should be saying things like their ideas of time represented as a clock
	+ Do these clocks HAVE to be functional?
		- Nope, if the clock not having a function is part of the piece than there does not have to be
	+ How many thumbnails do you need to OK with me before you get started on the computer?
* Have students get their sketchbooks
	+ At least 5 preliminary sketches
* Work time
	+ Go around and check in with students as they are sketching, brainstorm.
	+ Do this for about 20 minutes
* Illustrator or Corel Draw
	+ Show students to use vector rather than raster and very simple navigation tools
* Clean up
	+ Put away sketchbooks and materials
	+ clean desks
	+ push in chairs
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| **Day 2:*** What should be ready before class starts
	+ Machines are working
	+ computers are working
* Set expectations for the day
	+ Show me your 5 sketches before starting on the computer to turn them into vector images (LAST DAY TO TURN IN SKETCHES)
* Power Point
	+ Review for students who missed last class
	+ and also review quickly for those who were here
* Illustrator and Corel
	+ Quickly review by asking them questions like:
		- Where’s the pen tool? Where do you save your image? How do you change contrast and brightness?
* Work time
	+ Students should either be working on their sketches or starting their vector image on the computer
	+ Go around checking in with each student for at least 5 minutes each, looking at their quality of drawings and navigating the program.
	+ Students should be done with sketches by today
* Clean up
	+ Push in chairs, clean off desks, put away sketchbooks and materials, log off computers
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| **Day 3:*** What should be ready before class starts
	+ Computers and machines working
* Set expectations for the day
	+ Sketches should be done and everyone should already be on the computers working on their vector images.
	+ If you are done with your vector images then you run them by me and you can get your clock material and send your design through the engraver computer.
* Demo the laser engraver
	+ you put your “.ai” file onto a flash drive then plug it into the laser engraver computer
	+ open the ai file in Corel draw.
	+ Follow the directions from this pdf: <http://www.csufablab.org/wp-content/uploads/2013/09/Laser-step-by-step-tutorial.pdf>
	+ READ DIRECTIONS CAREFULLY!
* SAFETY and rules
	+ Do NOT open machine while it is operating
	+ turn on the ventilation while it is working
	+ Don’t stare at the laser for too long because it can cause eye damage
	+ Turn off laser when not in use
	+ Watch the machine to make sure that it is operating correctly
* ASK:
	+ What file type do you need to save to create your clock face? **.ai file**
	+ What color does your curve have to be to cut through the material? **red**
	+ What width must you set your curve? **hairline**
	+ What must you turn on before operating the machine? **the blower ventilation**
* Work time
	+ Monitor the laser FREQUENTLY to ensure proper machine use
	+ Check in with students, 5 min each
	+ By the end of class students should have something in ai format
* Clean up
	+ Push in chairs, clean off desks, put away sketchbooks and materials,save files, log off computers, sweep the floor around the engraver
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| **Day 4:*** What should be ready before class starts
	+ Laser engraver is working, computers are working
* Set expectations for the day
	+ Last day to create ai file
	+ Preferable to have clock faces finished too, but not absolute
* ASK:
	+ What are the safety concerns with the laser engraver? **turn on the blower, do not open while in use, do not stare at laser while in use**
	+ What should be done by the end of class today? **ai files**
* Work time
	+ Monitor laser FREQUENTLY to ensure correct usage
	+ Check in with students 5 minutes
* Clean up
	+ Push in chairs, clean off desks, put away sketchbooks and materials, save files, log off computers, sweep the floor around the engraver
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| **Day 5:*** What should be ready before class starts
	+ Laser engraver working, 3D printer working, computers working
* Set expectations for the day
	+ Today we will be strictly working in the program Rhinoceros. I will show you the basic techniques that most of you will probably be using to create the hands of your clock
	+ Ask questions as you have them, work together, this program is VERY DIFFICULT so try not to get too frustrated and do your best. I will be here to help you and we can figure it out together.
* Demo program
	+ Open Rhinoceros 5 and chose to expand the perspective “top”
	+ Be sure you have the following before continuing
		- in the “transform” tab
		- check the snap options “end” and “mid” along the bottom of the screen
		- On the very bottom make sure “Osnap” is clicked (this means Object snap)
		- In Properties make sure your units are in inches
	+ Use the “control point curve” to create a curve, when you are finished right click
	+ mirror the curve with the “mirror” tool under the transform tab
	+ Highlight both curves and select the “edit points on” and you will see end points and mid points appear
	+ drag the end point of one curve to meet up with the end point of the other curve (this is why we turn on our “end” object snap on)
	+ if your shape has a gap, use the “polyline” tool to fill the gap and right click
	+ select the entire shape so it is all highlighted, and combine the lines using “join” (which is the tool with puzzle pieces)
	+ No change your view to “perspective” instead of “top”
	+ highlight the object and at the top select “solid” → “extrude planar curve” → “straight” → choose shortest height
		- change the Display (on the right) to “shaded”
	+ to measure your hand choose “Dimension” (at the top) → “Linear dimension” → click the tip of your object and the other end, then drag to view the numbers (this is in inches)
	+ IF you want to make your curve longer or shorter, select “Gumball” at the bottom of the program (where you click Osnap)
		- use these tools to make it change scale
	+ When you are happy with it select the object(s) go to “File” → “Export selected” → change type to “.stl” → name your project first initial last name (ex: askipp) → save it to appropriate folder
	+ Send it to 3D printer, YAY!
	+ **VOCAB: NURBS, Mesh**
* SAFETY and rules
	+ Do not open machine while it is working
	+ Be patient, the machine is slow so don’t take out your anger on it because it doesn’t know any better
	+ Do not poke people with your clocks hands
* ASK:
	+ What are the 3D printer rules? **not open it while its working, don’t beat it up for being slow, poke people with printed objects**
	+ What file type must you save it as? **.stl**
	+ How do you combine all the separate curves? **join tool**
	+ Anything else unclear that I can go over again? You may start working if you have no more questions
* Work time
	+ Monitor the 3D printer FREQUENTLY
	+ Everyone should be working on the Rhino program today or sketching more ideas for their clock hands
	+ check in with each student, at least 5 min each
	+ If there is a question that keeps popping up all the time draw attention to the front of the class and write how to troubleshoot that problem on the white board for everyone to see
* Clean up
	+ Push in chairs, clean off desks, put away sketchbooks and materials, save files, log off computers, sweep the floor around the engraver
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| **Day 6:*** What should be ready before class starts
	+ Make sure engraver is working, computers, and 3D printer
* Set expectations for the day
	+ Today is your last full work day, if you need more time you can come in during lunch or after school
	+ You may use this time to work on the computers, engraver, and 3D printer
	+ Next class be prepared for the following:
		- Critique → prepare to talk about and defend your piece, also talk about your process
		- hang your piece on a wall (or not depending on what your meaning is)
		- if it is site specific in the school hang it there and we will all go talk about it where it is
		- if it is site specific and NOT in the school take a high resolution photo and we will display it on the projector (email this image to me so it is ready to go next class)
* Work time
	+ Check in with students to make sure they are all prepared for critique next class (5 min each minimum)
	+ Monitor the 3D printer and engraver FREQUENTLY
* Clean up
	+ Push in chairs, clean off desks, put away sketchbooks and materials, save files, log off computers, sweep the floor around the engraver
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| **Day 7:** * What should be ready before class starts
	+ Projector and computer hookups are working
* Set expectations for the day
	+ CRITIQUE! Take 5-10 minutes to set up your piece
	+ Remember we are giving constructive critisism, not “why do I think it is ugly” think about what might make the piece more successful based on the artists idea
	+ Think about material, does the material work well with this clock?
	+ Are the artists ideas evident in the piece?
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| **Student reflective/inquiry activity:** (Sample questions and activities [i.e. games, gallery walk, artist statement, interview] intended to promote deeper thinking, reflection and refined understandings precisely related to the grade level expectations. How will students reflect on their learning? A participatory activity that includes students in finding meaning, inquiring about materials and techniques and reflecting about their experience as it relates to objectives, standards and grade level expectations of the lesson.) |
| Have students hang their piece if it is site specific. If it is hung outside the school have students email a high resolution photo for the class to critique from the classroom projector. If it is inside the school, have the class go to the location and discuss it there. Other students may use tables or hang them from the ceiling (wherever they think their piece can be interpreted based on the meaning best)Have a “hot potato” which can be a stuffed animal, or a ball, to act as the initiation for students to comment in the critique. Students cannot pass the potato back to the person who had it previously, and are only allowed 1 pass not to comment. Students can volunteer to be critiqued first or the teacher can choose based on where they want to take the class for critique. For each piece have the students thinking about these questions (get at least 4 good comments per piece but no more than 6 (students will get bored)):* What elements in the piece reflect the artist’s idea of time?
* What does the material say about the piece? What material might work better?
* What colors do you see? How is it helping in describing the piece?
* Do the hands of the clock work with the piece, why or why not? What might be more successful?
* Does the shape of the face work with the artist’s intended meaning? What about all the other elements on the clock face?
* Does the space it is in help the viewer?
* Is the clock functional, or not? How does that support the artist’s intent?
* Did the artist use text or image or both? Does this work well with the piece?
* What was your process?
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| **Post-Assessment (teacher-centered/objectives as questions):** (Have students achieved the objectives and grade level expectations specified in your lesson plan?)  | **Post-Assessment Instrument:**(How well have students achieved the objectives and grade level expectations specified in your lesson plan? Rubric, checklist, rating scale, etc.) |
| * Did students create a clock face reflecting a personal view of time?
* Did students create hands using the 3D printer that compliments the clock face?
* Did students use new technologies including the laser etcher, 3D printer, and Rhino program?
* Did students participate in critique and class discussion?

Students will have a copy of the post assessment (available online, and optional physical copy in classroom) so they know what is expected for this project. I would conduct this post assessment by first having them grade themselves, then I go back and see what they thought about their own project. I will know how students used technology, because they have to submit the files they used into me and I will review them with their piece. |

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|  | Advanced | Proficient | Developing | Basic |
| Clock face | Clearly symbolized their personal view of time, and meaning was clear | somewhat symbolized their personal view of time, not very clear | Had little to no relation to their personal view of time | Did not create a clock face |
| Clock hands | Related to their clock face | Somewhat related to the face | Had little to no relationship to the face | Did not create clock hands |
| Technology | Used all technologies, can use them independently | Used 2-3 new technologies, can use them independently | Used 1-2 new technologies, can use them independently | Did not use any of the new technology |
| Participation | Participated during discussions and critique, provided helpful and useful information | Participated during discussions and critique | Participated during discussions OR Critique | Did not participate |
| Studio Habits | Clearly and always exhibited | Clearly and mostly exhibited | Somewhat and not consistently exhibited | Not exhibited |

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| **Self-Reflection:** ***After the lesson is concluded*** write a brief reflection of what went well, what surprised you, and what you would do differently. Specifically address: (1) To what extent were lesson objectives achieved? (Utilize assessment data to justify your level of achievement.) (2) What changes, omissions, or additions to the lesson would you make if you were to teach again? (3)What do you envision for the next lesson? (Continued practice, reteach content, etc.) |
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